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AIR POLLUTION ABSTRACTS

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This periodical is published to inform air pollution personnel of the Environmental Protection Agency (EPA), and others, of technical literature recently accessioned by the Air Pollution Technical Information Center (APTIC). For each accession, its Abstract Number, APTIC accession number, bibliographic citation, and abstract are given. Translations are cited with their sources whenever possible. The subject fields are as follow: Emission Sources; Control Methods; Measurement Methods; Air Quality Measurements; Atmospheric Interactions; Basic Science and Technology; Effects-Human Health; Effects-Plants and Livestock; Effects-Materials; Economic Aspects; Standards and Criteria; Legal and Administrative; Social Aspects; and General and Miscellaneous. All abstracts are listed under one of the above subject fields. A subject and author index are included. This issue contains abstracts 11084 - 11986.

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AIR POLLUTION ABSTRACTS

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Personal authors (maximum of five per document) are arranged alphabetically. The names are presented last name first. The title of the document is indented below the author's name; when the author was the first author of a title, it is designated by an asterisk. The Abstract Number follows on the next line.

Use of funds for printing this publication approved by the Director, Bureau of the Budget, March 31, 1970.

INTRODUCTION

This periodical is published to inform personnel of the Environmental Protection Agency's Office of Air Programs (OAP), and others, of technical literature recently accessioned by the Air Pollution Technical Information Center (APTIC). For each accession, its Abstract Number, APTIC accession number, bibliographic citation, and abstract are given.

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As another service, abstracts of all literature in APTIC (not just in a single issue of this periodical) on any subject related to air pollution will be provided free of charge upon request. APTIC can search information more recent than that in the current issue of this periodical because of the lapse of time entailed by editorial, make-up, and printing work. More than 1400 subject index terms are available for such searching--more than those included in the subject index in each issue.

SUBJECT FIELDS AND SCOPE NOTES

1. EMISSION SOURCES

Information pertaining to an industry, process, or material associated with air pollution. Documents in this category are concerned primarily with characteristics of a specific class of emission sources including types, rates, industries; secondary coverage may include effects, control methods, etc.

2. CONTROL METHODS

Includes equipment and both specific source control and general abatement efforts. Included are documents describing the operating principles, design, operation, efficiency, etc., of equipment and methods of removing pollutants. The scope of the document can vary from a device for a specific source to an approach applicable to an entire industry—e.g., automobiles.

3. MEASUREMENT METHODS

Includes equipment as well as methods. Confined to development, testing and evaluation of pollutant determination methods (sampling, analytical, monitoring) and equipment, as such. Data obtained by use of methods in specific applications are placed in the applicable subject categories.

4. AIR QUALITY MEASUREMENTS

Pollution measurements in the ambient air, generally related to specific geographical locations, such as area surveys. Also includes general reviews of area situations and emission source inventories.

5. ATMOSPHERIC INTERACTION

All chemical and physical phenomena occurring in the atmosphere. Included is material on dispersion, air pollution forecasts, meteorological effects, topographical effects, photochemical reactions in the atmosphere, etc. Laboratory studies of photochemical reactions are assigned to Basic Science and Technology.

6. BASIC SCIENCE AND TECHNOLOGY

General discussions or data compilations for the basic physical and chemical properties of pollutants. Theoretical and laboratory studies on related chemical and biological reactions and mechanisms. Mass transfer and other basic knowledge related to process engineering applications in emission control or abatement. Excludes photochemical studies in the atmosphere and biochemical studies related to effects of air pollution.

7. EFFECTS—HUMAN HEALTH

Covers medical and epedemiological studies; biological effects other than those on plants and livestock produced by air pollutants; laboratory animal experiments.

8. EFFECTS—PLANTS AND LIVESTOCK

Effects on vegetation—crops, trees, other plants—and on livestock as distinguished from laboratory experimental animals.

9. EFFECTS—MATERIALS

Deterioration, corrosion, etc., of physical materials, buildings, and structures.

10. ECONOMIC ASPECTS

Economic implications of air pollution and its control, e.g., economic losses from pollution damage, and costs of control programs or equipment in general.

11. STANDARDS AND CRITERIA

Recommended or adopted guides, criteria and standards for allowable emission limits or pollutant concentrations, air quality, equipment characteristics, and fuels.

12. LEGAL AND ADMINISTRATIVE

Legal aspects include legislation. ordinances, rules, litigation, hearings, decisions, etc. Administration covers administrative and miscellaneous information concerning control agencies and control and research programs. Typical topics are personnel, budgets, contractural activities and program descriptions.

13. SOCIAL ASPECTS

Sociological and psychological aspects such as social attitudes, public opinion studies, public relations, and public information.

14. GENERAL AND MISCELLANEOUS

Reviews of general problems, trends and background. Documents not assignable to other categories.

ABSTRACT BULLETIN

EMISSION SOURCES

11084 APTIC NO. 27272

Stafford-Gaffney, W.

AIR POLLUTION AND THE MOTOR VEHICLE IN AUSTRALIA. *S. African Mech. Engr. (Johannesburg), 20(11):360-363, Nov. 1970.*

The main causes of automotive pollution--emission of carbon monoxide, oxides of nitrogen, and unburnt hydrocarbons which form a photochemical smog under the action of bright sunlight--are outlined. These include incomplete combustion, weak or rich fuel air ratios, and the mode of engine operation. Excessive diesel smoke results from poor maintenance of fuel pumps and injectors, excessive fuel enrichment under temporary loads as when hill climbing, or excessive engine overloading. In doses increasing from 50 ppm over an 8 hour period, CO can produce effects ranging from dizziness, loss of vision, and lack of muscular control to acute nausea, collapse, coma, and finally death. Carbon monoxide is absorbed in the blood stream and severely restricts the blood's oxygen carrying capacity. Lead alkyls and asbestos fibers are also mentioned as they result from motor vehicles. Desirable courses of action to combat pollution are discussed along with possible control methods for both gasoline and diesel engine emissions. Recommendations which include emission standards are suggested to prevent serious pollution problems from developing in Australia in the future. (Author abstract modified)

11085 APTIC NO. 27276

Warren, Paul C.

HOW PLASTICS BURN. *Soc. Plastic Engrs. J., 27(2):17-22, Feb. 1971. 58 refs.*

A brief review of the literature on polymer combustion and its inhibition is presented, including flames, flammability measurement, and general types of inhibitors, with emphasis on their chemistry. To obtain sensitive and reproducible values, burning speeds in premixed flames are determined by dividing the volumetric fuel-oxidant flow by the area of the flame cone. Diffusion flame speeds are measured on an opposed-jet burner, where fuel and oxidant gases flowing together from opposite sides burn between the jets. A flame can be cooled below its limit temperature so that it will no longer propagate, and relative extinguishment information can be obtained by measuring the fuel-rich and fuel-lean flammability limits. Precision of the oxygen index test allows various polymers to be rated according to their relative flammabilities. On the reasonable assumption that organic polymers have flames similar to burning hydrocarbons, the mechanism of the premixed methane-oxygen flame can be analyzed as a model for the more complex polymer flame. Burning polymer is apparently characterized by independent pyrolysis and flame zones. Heat flow calculations and the sensitivity of polymer degradation to oxygen catalysis are discussed. There are three general ways to render a polymer less flammable: inhibit flame reactions, retard condensed phase reactions, and slow down the heat and mass transfer between the two regions. By far the most important flame retardants are the organic halides. Antimony oxide is a completely ineffective inhibitor in polyethylene, but in the presence of sufficient halogen, it greatly enhances halogen extinguishment. Halogen synergism is mentioned, as well as the organophosphorus compounds as fire retardants.

11086 APTIC NO. 27293

Winthrop, S. O.

AN OVERVIEW ON AIR POLLUTION. *Chem. in Can., 23(2):21-25, Feb. 1971.*

In 1966, the five air pollutants accounting for 98% of all emissions in the U. S. were carbon monoxide (52%), sulfur oxides (18%), hydrocarbons (12%), particulates (10%), and nitrogen oxides (6%). By far the greatest source of the pollutants is the combustion of fossil fuels. Other important sources are industrial activities such as iron and steel manufacturing, metal smelting, oil refining, pulp and paper, chemical, and petrochemical operations. The adverse health effects associated with air pollutants are noted, as are their effects on vegetation and their possible effects on climate and global ecology. The ultimate control of air pollution will require the application of science and a greatly increased research and development effort by governments, universities, and industries.

11087 APTIC NO. 27297

First, Melvin W. and Raymond L. H. Murphy, Jr.

CARBON MONOXIDE EXPOSURES FROM SNOW MELTING MACHINES. *Am. Ind. Hyg. Assoc. J., 31(6):754-757, Nov.-Dec. 1970.*

Portable or stationary snow machines are coming into wide usage in cities and airports. Large units are capable of melting 50 tons of ice/hr by burning 125 gallons of fuel oil/hr in immersion-type burners that discharge hot combustion gases through the melting pool to extract the maximum quantity of heat. When improperly designed or operated, the flame can impinge on snow or icewater before combustion is complete with the resulting formation of large amounts of carbon monoxide. Following the death of one person and serious CO poisoning of another, measurements were made at the operator's station of one large machine. To CO concentrations were in excess of 2000 ppm. Renovation of the burners in these units reduced CO concentrations to less than 50 ppm, the Threshold Limit Value. (Author abstract modified)

11088 APTIC NO. 27301

Schaefer, Vincent J.

THE THREAT OF THE UNSEEN. *Saturday Rev., 54(6):55-57, Feb. 6, 1971*

The global background concentration of all particles in the lower atmosphere is about 200 cc; anything above this number can be interpreted as some degree of pollution. Field studies with instruments built to detect and measure very small or invisible particles show that automobiles and airplanes are major sources of such particles. Measured concentrations were 126,000/cc above a New York City street; in excess of 50,000/cc on a highway in the Adirondacks; 10,000,000/cc in a tunnel; and 80,000/cc to more than 1,000,000/cc on airport roads during plane loading and unloading. Once invisible particles enter the atmosphere, their residence time is likely to range from a month to several years. While the role played by the particles in health is not clear, the fact remains that the majority of such particles that reach the lungs remain there. Thus air pollution control laws must be directed at invisible as well as visible offenders.

11089 APTIC NO. 27321

Greenfield, M., R. Koontz, R. Johnson, and H. Morewitz

COMPARISONS OF AEROSOL EXPERIMENTS WITH A MODEL USED IN REACTOR SITING EVALUATION. *Harvard Univ., Boston, Mass., Harvard Air Cleaning Lab. and Atomic Energy Commission. Washington, D. C., Div. of Reactor Development and Technology, Proc. At. Energy Comm. Air Cleaning Conf., 11th, Richland, Wash., 1970, p. 26-48. 24 refs. (Aug. 31-Sept. 3)*

NTIS: CONF 700816, Vol. 1

A comparison is presented of the HAA-3 computer code solution of th general equation of aerosol agglomeration and data from various experiments on sodium oxide aerosols performed at high-particle concentrations in test vessels up to 30 ft in height the approximate height of primary vaults for a typical liquid metal fast breeder reactor. The good agreement between computed and experimental data indicates that the model can be confidently used for fast breeder siting studies. Aerosol attenuation factors for typical fast breeder containment systems were calculated with the model. The results show that the fraction of the released mass which can leak to the atmosphere is inversely proportional to the initial concentration and that, as the containment height is increased, the leaked mass will decrease for high concentrations in a stirred environment. (Author introduction modified)

11090 APTIC NO. 27353

Abelson, Philip H.

SCIENCE AND THE ENVIRONMENT IN THE SEVENTIES. *Surveying Mapping, 30(2):229-237, June 1970. 7 refs. (Presented at the ACSM Annual Meeting, 30th, ACSM-ASP General Assembly, Washington, D. C., March 4, 1970.)*

The prospects for abatement of pollution in the 70's are discussed with special attention to water and air pollution. Although the fouling of rivers, lakes, and even the ocean has been growing rapidly toward crisis proportions, improved new technology is available for cleaning water. Experience at Lake Tahoe and other areas where advanced sewage treatment is being tested has been good. It justifies optimism that very high standards of clean-up can be achieved at prices that are not prohibitive. If many of our lakes are to be saved, this new technology must be employed. Clean-up of rivers will be feasible, though the cost of the required separation of storm and sanitary sewers may be heavy. The cost of a considerable improvement in air quality is comparatively small, and substantial progress has already been made, particularly in reducing auto-induced pollution. The improvements incorporated in the 1971 models will cost no more than $48.00/vehicle. When all the changes now envisioned are completed, automobiles will no longer be a major source of air pollution. Progress against sulfur oxides produced by the burning of fuel has been slower. Progressively improved control is being achieved in New York by step-wise reductions in the allowable sulfur content of fuel. Removal of sulfur dioxide from stack gases is also potentially feasible. Restoration of the environment will also require more progress in the areas of waste disposal and city planning.

11091 APTIC NO. 27361

Rao, S. T. R., T. J. Kuo, and R. H. Essenhigh

CHARACTERIZATION OF STIRRING FACTORS BY COLD-MODEL SIMULATION. *American Society of Mechanical Engineers, New York, Incinerator Div., Proc. Natl. Incinerator Conf., Cincinnati, Ohio, 1970, p. 314-326. 17 refs. (May 17-20.)*

Stirring factors were measured by a helium-tracer technique in an isothermal model of a simple test incinerator. Two arrays of jets generated opposed vortices in the region simulating the overbed combustion region. The general flow pattern was found to approximate well the Bragg criterion for optimum flow pattern of an initial stirred reactor region followed by a plug-flow region. The boundary between the two regions was physically detectable with unexpected precision. The effectiveness of stirring changed with 'offset angle' when the jets were offset about 30 deg from the directly opposed position. With other factors constant, the size of the stirred section remained unchanged with the variation of offset angle. However, it increased and the stirring factor decreased as the space between the jet arrays was increased. The results suggest that the underfire air rate through incinerator beds should be kept as low as possible consistent with gasifying the solid waste at the rate required. They also suggest that several problems could be met simultaneously by having the overfire air jets able to swivel horizontally and to tilt vertically at the same time. (Author abstract modified)

11092 APTIC NO. 27413

Schmitt, C. R.

SURVEY OF THE FLY-ASH DISPOSAL SYSTEM AT THE OAK RIDGE Y-12 PLANT. *Union Carbide Corp., Oak Ridge, Tenn. Nuclear Div. 23p., April 20, 1970. 8 refs.*

NTIS: Y-1713

A survey was made at a nuclear steam plant to determine the degree of particulate contamination of a fly-ash retention basin and dam, a water-filled quarry and the ground below it, and a downstream lagoon inlet to a lake. Samples of dry fly ash and fly-ash solids in the quarry and lagoon inlet were obtained for evaluation by photomicrography, particle-size distribution analysis, X-ray radiography, and X-ray diffraction. The particle measurement and composition studies are summarized in tabular form. Also presented are photomicrographs of the particle size and shape of fly-ash solids in the quarry. The sampling program showed that a small percentage of fly-ash floats as a surface scum on the water-filled quarry and accumulates downstream as surface scum on the lake. The laboratory studies identified the surface deposit as hollow, spherical microspheres of fly ash. Corrective measures have been initiated to impound the bouyant fly-ash microspheres at a floating-log barrier located at the clear-water discharge end of th quarry. In the event that the accumulation of impounded surface scum becomes too great, use of a portable mechanical skimming apparatus is recommended.

11093 APTIC NO. 27433

Blosser, Russell O., Andre L. Caron, and Leon Duncan

AN INVENTORY OF MISCELLANEOUS SOURCES OF REDUCED SULFUR EMISSIONS FROM THE KRAFT PULPING PROCESS. *Preprint, Air Pollution Control Assoc., Pittsburgh, Pa., 13p., 1970. 2 refs. (Presented at the Air Pollution Control Association Annual Meeting, 63rd, St. Louis, Mo., June 14-18, 1970, Paper 70-75.)*

Details are given of a special field study now in progress to determine the composition, magnitude, and factors affecting the discharge level of miscellaneous source emissions for a sample representing about 20% of the U. S. kraft industry. These miscellaneous sources include the lime kiln, brown stock washer ventilation system exhausts, brown stock seal tank and vacuum system exhaust vents, black liquor oxidation system exhaust vents, and smelt tank vents. The study is using two specially-designed mobile laboratories equipped with total sulfur analyzers and chromatographs. Process variables that may have some effect on miscellaneous source emissions and which are included in this investigation are residual sulfur content of process materials and combustion conditions in lime kilns.

11094 APTIC NO. 27434

Minnick, L. John

CONTROL OF PARTICULATE EMISSIONS FROM LIME PLANTS. *Preprint, Air Pollution Control Assoc., Pittsburgh, Pa., 30p., 1970. (Presented at the Air Pollution Control Association, Annual Meeting, 63rd, St. Louis, Mo., June 14-18, 1970, Paper 70-73.)*

Results are given of a survey by questionnaire, responded to by 20 companies, of current control practices in lime manufacturing plants for emissions from quarrying, stone processing, lime kilns, lime hydration and driers, and fugitive dust sources such as roadways, stockpiles, and transport equipment. The operating efficiencies and costs of the wide variety of wet and dry equipment in use are briefly evaluated, and some information is included on test methods and monitoring systems. The data collected will be applied to preparing effective recommended emission standards for the industry.

11095 APTIC NO. 27437

Shieh, Wen-shong and Robert H. Essenhigh

A SUMMARY OF THE STUDY OF COMBUSTION BEHAVIOR IN A TEST INCINERATOR. (PROGRESS REPORT). *Pennsylvania State Univ., University Park, Combustion Lab., Research Grant 5R01 AP00397, 21p. Dec. 1970. 6 refs.*

Two sets of air jets were arranged to create two opposed vortices i a test overfeed bed incinerator. The applicability of this configuration for incinerators was evaluated experimentally and theoretically, as were important parameters governing combustion processes. Measurements of vertical flame and vertical wall temperature distributions showed that the highest temperatures occurred in the stirred section generated by the opposed vortices. As smoke and carbon monoxide burned in the stirred section, there was a relatively steep rise of water vapor and carbon dioxide. The CO was eventually burned completely. The activation energy of the smoke combustion was calculated to be 12,000 cal/mole. The required size of incinerators to burn smoke to 99.99% of completion is shown graphically. There is an optimum conversion in the stirred reactor for the minimum size of incinerators. This optimum conversion depended theoretically on the value of the activation energy of smoke.

11096 APTIC NO. 27455

Linden, Lawrence H. and John B. Heywood

SMOKE EMISSION FROM JET ENGINES. *Combust. Sci. Technol., 2(5-6):401-411, Jan. 1971. 42 refs.*

The fundamental processes determining the amount of smoke in the exhaust of a gas turbine engine are examined. The configuration of modern combustors and the state of knowledge of the processes occurring within the combustor are reviewed. Data from laboratory flame studies of carbon formation are then discussed and correlated with engine and combustor exhaust studies. Solid carbon is the nonequilibrium product of fuel vapor-air combustion in locally fuel rich zones. Calculations of carbon oxidation rates are then used to show the significant fractions of the carbon formed in the rich regions of the primary zone may be consumed in the leaner regions of the primary zone and in the secondary zone. Finally, combustor design features desirable for minimal exhaust smoke are summarized, and areas where further research would be most beneficial are identified. (Author abstract)

11097 APTIC NO. 27457

LOW EMISSION AUTOMOTIVE TURBINE UNVEILED. *Gas Turbine Int., 12(1):39-41, Jan.-Feb. 1971.*

The Williams gas turbine engine will be used as part of a program in New York City to sponsor a number of different vehicular powerplants. Specifications of the engine are indicated. It is equipped with dual rotating ceramic generators, developed by Corning, to provide better fuel economy and cool the exhaust gases. The unit has been designed to run on unleaded gasoline or No. 2 diesel fuel. The car, an American Motors compact Hornet, powered by the 80 hp Williams gas turbine is presently estimated to cost $240,000. Based on current 1972-1974 Federal standards, the engine is four times better than standards in terms of hydrocarbons and five times better in terms of carbon monoxide. However, nitrogen oxides emissions still present a problem. With thoughts of maintenance in mind, the turbine, with its 75% fewer moving parts, lack of vibration, lack of radiator and fewer tuneups, could represent significant production cost cuts for the manufacturer, as well as for the owner.

11098 APTIC NO. 27458

Felt, Arthur E. and Robert V. Kerley

USE OF LEAD-FREE GASOLINE CAN PRESENT SERIOUS PROBLEMS. *Automotive Eng., 79(3):54-56, March 1971.*

Consequences of leaving the lead out of gasoline may include an increase in engine octane number requirements and larger quantities of undesirable exhaust pollutants. The carbonaceous deposits formed in the absence of lead have a higher heat capacity than lead deposits, and so, after extended mileage, the result is a higher octane requirement for the engine operated on nonleaded gasoline. Aromatic blending stocks are used to bring back the octane number 'lost' when the lead is left out of gasoline, and the various emissions are increased in proportion to this increase in aromaticity. Results of octane measurements with 26 pairs of cars, one car of each pair having been operated on nonleaded gasoline and the other car on leaded gasoline, are mentioned. The major direct chemical effect of removing lead is an increase in the aldehyde content of the exhaust. The indirect effects occur when aromatic hydrocarbons are used to upgrade the octane number of gasoline in the absence of lead. There are three primary indirect effects: increased aromatic aldehydes, increased photochemical (smog forming) reactivity of the exhaust gases, and increased emission of polynuclear aromatics and phenols.

The presence or absence of lead antiknocks in a fuel of constant hydrocarbon composition has no effect on polynuclear aromatic hydrocarbon emissions. The controlling factor is the aromatic content of the fuel burned. Some of these hydrocarbons are known to induce tumor formation in experimental animals.

11099 APTIC NO. 27471

Govan, Francis A.

CONTROL EQUIPMENT NOT ALWAYS THE ANSWER TO POLLUTION CONTROL. *Bldg. Systems Design, 68(2):16, 17, 37, Feb. 1971.*

In the past, the decision of whether a boiler was polluting the atmosphere was based primarily of the visible plume. Most new or proposed regulations, although still specifying visible smoke as a criterion, also incorporate particulate emission levels based on source sampling. The trend is toward more stringent levels and an accepted value of 0.2 pounds/million Btuh input appears likely. However, these new regulations do not necessarily mean that it is necessary to install air pollution control equipment. Proper adjustment, integration, operation, and maintenance of a boiler plant should keep particulate emissions within the acceptable limits.

11100 APTIC NO. 27472

FLUIDIZED BEDS--PART 2: FALCONBRIDGE PROCESS KEYED TO F-B UNIT. *Can. Chem. Process., 55(2):25-28, 29, Feb. 1971.*

When Falconbridge Nickel Mines starts up its new Quebec complex, it will employ two new processes to extract and refine 30 million pounds/yr of nickel from Bessemer matte. The first process, which bypasses sulfur dioxide formation, involves regenerative hydrochloric acid leaching to convert nickel in the matter to nickel chloride. The second process is centered around a fluidized-bed reactor in which the nickel chloride crystals are converted to free-flowing nickel oxide granules, easily reducible to nickel powder. Either product (oxide or powder) can be marketed for a variety of end-uses in alloying, powder metallurgy, and electroplating. Exhaust gases from the reactor, consisting of hydrogen chloride, combustion products, and suspended oxide particles, will pass through cyclones for the removal of the oxides fines and then through scrubbers to provide makeup hydrochloric acid for the leaching unit. Chlorides of cobalt, iron, manganese, and magnesium could be treated by the same process to give high-purity oxide granules.

11101 APTIC NO. 27473

Saito, Takeshi and Tatsuyuki Takahashi

OXIDES OF NITROGEN FROM ACCELERATION GASOLINE ENGINE. *(Gasorin engin no kasokuji ni okeru haiki ni tsuite). Text in Japanese. Jidosha Gijutsukai Ronbunshu (Proc. Soc. Automotive Engrs.), no. 1:28-34, Nov. 1970. 3 refs.*

Nitrogen oxides from an accelerating 4-cycle, water-cooled gasoline engine were measured with an engine test bench that simulated vehicle acceleration on the road. Of the engine variables studied, air-gasoline ratio and ignition point were found to have a marked influence on emissions during both acceleration and steady-state conditions. The concentration of nitrogen oxides in acceleration exhaust can be estimated from steady-state exhaust emissions, although agreement between the two sets of emission is not qualitative due to differing air-gasoline ratios. By considering the special character of acceleration emissions and the special character of air-gasoline ratio and spark timing in acceleration, it should be possible to control nitrogen oxides emission during acceleration without increasing the quantity of carbon monoxide.

11102 APTIC NO. 27479

Newman, D. J.

NITROGEN OXIDE POLLUTION: NITRIC ACID PLANT POLLUTANTS. *Chem. Eng. Progr., 67(2):79-84, Feb. 1971. 9 refs.*

Nitric acid is commercially produced by reacting ammonia with air to produce nitrogen oxides which are then absorbed in water to yield the acid. Basically, three pieces of equipment are required to carry out the reactions indicated: a reactor, a cooler, and an absorber. Operating variables of the process are indicated. The pollution problem of a nitric acid plant is the unabsorbed nitrogen oxides in the tail gas leaving the absorption tower, typically at a concentration in the range of 1500 to 3000 ppm by volume. A major fraction of these oxides is in the form of the red dioxide, so that the vented gas has a distinct yellow to red color. Incorporation of the catalytic combustor, besides improving power recovery, yielded the happy side effect of converting red nitrogen dioxide in the tail gas to colorless nitric oxide. The catalyst used has generally been platinum or palladium supported on nichrome wire, or on alumina in the form of pellets or a honeycomb structure. Catalytic combustion is discussed, as well as improved absorption and adsorption. Cost consideration are included. Adsorption of nitrogen oxides on molecular sieves has been demonstrated in the laboratory and may prove economical in existing plants.

11103 APTIC NO. 27501

Vandergrift, A. Eugene, Larry J. Shannon, Eugene E. Sallee, Paul G. Gorman, and William R. Park

PARTICULATE AIR POLLUTION IN THE UNITED STATES. *Preprint, Air Pollution Control Assoc., Pittsburgh, Pa., 30p., 1970. 2 refs. (Presented at the Air Pollution Control Association, Annual Meeting 63rd, St. Louis, Mo., June 14-18, 1970, Paper 70-148.)*

The identity, characterization, and quantity of the national particulate air pollution problem from stationary sources were determined. Particulate emissions from stationary sources were obtained from data on emission factors, grain loadings, and materia balances. The principal method used for establishing the tonnage emitted by an industry utilized uncontrolled emission factors. Total tonnage emitted was calculated from an emission factor for the uncontrolled source, the total tonnage processed per year by the industry, the efficiency of control equipment used, and the percentage of production capacity equipped with control devices. Particulate emission totaled approximately 21 times 10 to the 6th power tons per year. Major stationary sources included electric power generation plants, the forest products industry, agriculture and related operations, the crushed stone industry, the cement industry, and the iron and steel industry. Estimates of the total quantity of particulate pollutants were made up to the year 2000 by taking into account changes in production capacity, improvements in control devices, and legislative or regulatory action to enforce installation of control equipment. Forecasts indicated that particulate emissions can be reduced from 21 times 10 to the 6th power tons per year to 13 times 10 to the 6th power tons per year by 1980 through the installation of currently available control devices on all sources. (Author abstract modified)

11104 APTIC NO. 27510

Hodges, J. L., R. F. McAlevy, III., and J. H. Potter

NITRIC-OXIDE GENERATION IN A SIMULATED SPARK-IGNITION ENGINE. *Preprint, American Society of Mechanical Engineers, New York, 5p., 1970. 18 refs. (Presented at the American Society of Mechanical Engineers, Winter Annual Meeting, New York, Dec. 3, 1970, Paper 70-WA/PID-3.)*

A mechanical analog was built to study the thermochemical processes causing excessive nitric oxide emissions from spark ignition engines. The analog device is essentially a cylindrical, constant volume bomb in which the expansion of product gas is analogous to the expansion of product gas in an actual engine. Product gas concentrations of nitric oxide were measured a few seconds after combustion by a modified ultraviolet absorption technique. They were found to be a weak function of initial temperature and pressure and a strong function of equivalence ratio, resulting the familar 'inverted U' characteristic of measurements made on actual spark ignition engines. Measured concentrations were virtually the same after rapid expansion of product gas and after constant volume combustion. This implies that piston motion plays a relative minor role in the 'freezing' of nitric oxide in spark ignition engines. Freezing appears to depend instead on instantaneous local cooling resulting from radiation and the mixing of inhomogeneous product gases.

11105 APTIC NO. 27544

Kohayakawa, Takashi, Tsugio Ogawa, and Yasusada Masamoto

EXHAUST GAS OF AUTOMOTIVE VEHICLES - EFFECTS OF KNOCK ON EXHAUST COMPOSITION. *(Jidosha haiki gasu -nokku ga haiki gasu sosei ninyobosu eikyo nitsuite). Text in Japanese. Jidosha Gijutsu (Automobile Eng.), 24(4):353-356, April 1970.*

Isooctane and normal butane were employed as fuel for a commercial, 4-cycle, 4-cylinder engine, and knocking was controlled by the mixing ratio. Appearance and intensity of the knock were monitored by the pressure variation of the first cylinder. Exhaust manifold temperature was also monitored, and was employed as an auxiliary means for judging knock occurrence. Carbon monoxide and hydrocarbons in the exhaust were analyzed by nondispersive infrared analysis. Hydrocarbon was also monitored by flame ionization detection. Nitrogen oxides were analyzed by nondispersive ultraviolet analysis. Carbon monoxide concentration was independen of knock, that is, the mechanism of carbon monoxide generation was not affected by knock. Hydrocarbons, on the other hand, showed a slight decrease with knocking. Nitrogen oxides greatly increased with knocking; they almost doubled under heavy knocking. This was considered to be due to a sudden temperature rise in the combustion chamber, which favored the formation of nitrogen oxide. The effect of knocking had no relation to the air-fuel ratio. Exhaust gas temperature of the first cylinder was also monitored during the experiment. The temperature had a tendency to decrease as the octane value decreased. An extreme drop in the temperature was recorded at the knocking point.

11106 APTIC NO. 27617

Stockham, John D.

THE COMPOSITION OF GLASS FURNACE EMISSIONS. *Preprint, Air Pollution Control Assoc., Pittsburgh, Pa., 30p., 1970. 4 refs. (Presented at the Air Pollution Control Association, Annual Meeting 63rd, St. Louis, Mo., June 14-18, 1970, Paper 70-72.)*

The concentrations of sulfur oxides, nitrogen oxides, fluorine, chlorine, and carbon monoxide from two furnaces, one melting flint glass and the other melting amber glass, were determined either by adsorption on silica gel impregnations or by scrubbing the gases in liquid impingers, while grain loading of particulate matter was determined by filtering a sample of the effluent and weighing the collected material. The volume of effluent discharged was determined from velocity data obtained by a pitot tube traverse across a stack diameter. Solids loadings averaged 2.1 and 5.4 lbs/hr or 0.029 and 0.041 grains/scfm of exhaust gas for the flint and amber glass emissions, respectively. SO3 averaged 17 and 15 ppm, by volume, while the SO2 concentrations averaged 250 and 315 ppm. F and Cl concentrations were about 2 and 4 ppm, respectively. Nitrogen oxides concentration averaged 340 and 640 ppm. CO content in the flint glass effluent was 375 ppm and in the amber glass effluent, 40 ppm. Particle size, shape, and composition were determined using electron microscopic and spectroscopic techniques. The geometric median particle diameter, based on a size-frequency distribution by number, was about 0.12 micron. Three forms of sodium sulfate were identified; other elements identified as being present in major proportions were calcium, magnesium, silicon, barium, and chromium. (Author abstract modified)

11107 APTIC NO. 27628

Burakowski, Tadeusz

SOME METHODS AND FINDINGS IN RESEARCH ON TRACE ELEMENTS IN ATMOSPHERIC PRECIPITATION IN WARSAW. *(Niektore metody i wyniki badan substancji sladowych w opadach atmosferycznych w Warszarie). Przeglad Geofizyczny (Warsaw), 7(15)(3):193-202, 1962. 40 refs. Translated from Polish by Malgorzata Widymska, Central Inst. for Scientific, Technical and Economic Information, Warsaw (Poland), Scientific Publications Foreign Cooperation Center, 13p., 1967.*

NTIS: TT-65-50398

Devices and techniques for collecting rainwater samples for chemical analysis, without permitting accidental contamination of the samples from the air, container, or other sources, are reviewed, and a recently designed apparatus based on a Swedish model is described which has given good results in practice. The literature is reviewed in a discussion of which of the trace elements in air and precipitation should be considered as the most important. Some of the studies concern nitrogen compounds, sulfur compounds, chlorides, iodine, and other inorganic substances (such as calcium, magnesium, potassium, sodium, and the elements manganese, phosphoru, and arsenic), amino acids, formaldehyde, and measurements of electric conductance. Precipitation will reflect the degree and nature of air pollution from human activities, and plays the most important part in natural cleansing processes in air. Selection of a proper analytical method for rainwater samples will depend on such factors as required accuracy, sampling technique, available collecting and analyzing equipment, choice, and time and labor factors. Some of the applicable techniques for different trace elements are noted; they include flame photometry, colorimetry, potentiometric methods, and spectrophotometry.

11108 APTIC NO. 27654

LOW POLLUTION OIL BURNER DEVELOPED BY GULF CANADA. *Oilweek (Calgary, Can.), 21(46):22, 24-25, Jan. 4, 1971.*

A highly efficient low pollution industrial oil burner has been developed jointly by Gulf Oil Canada and the Ontario Research Foundation as a result of a seven-year $500,000 research project funded by the oil company. The Vortometric burner creates a whirling vortex of fuel and air to achieve essentially complete and smokeless combustion of even the heaviest petroleum fuels under low and excess air conditions. Formation of particulates is reduced as well as sulfur trioxide and nitrogen oxides, but sulfur dioxide continues to be mainly a factor of the amount of sulfur in the fuel. The burner also offers fuel savings on the order of 5%, an extremely wide range of efficient operation, and significantly reduced operating, control, and maintenance costs. Operating variables are indicated.

11109 APTIC NO. 27656

Potterton, S. T.

COMBINATION FUEL FIRING IN CYCLONE FURNACES. *Natl. Eng., 175(1): 10-12, Jan. 1971. (Presented at the Industrial Coal Conference, Purdue University, Lafayette, Ind., Oct. 7, 1970.)*

A method of firing which reduced the amount of ash passing through the boiler was very desirable and lead to the development of the cyclone furnace. The principal advantages of the cyclone furnace are: a low excess air requirement, 10-17%; the amount of ash going through the boiler is about 30% of that fired compared to 70% for pulverized coal firing; and fly ash collected in dust collectin equipment can be reinjected so that all ash removed from the boiler will be a granular, chemically inert slag. The cyclone furnace is a water cooled horizontal cylinder in which fuel is fired, heat is released, and combustion is completed. When firing coal, the fine particles are burned in suspension immediately upon admission to the cyclone and the heavier particles are thrown against the walls of the cyclone, which consists of studded tubes covered with refractory. These burning particles are held in the slag layer and scrubbed by the high velocity secondary air to complete combustion. Process variables are indicated, as well as slag viscosity, burner placement, oil burning, and the procedure for changing to oil firing from coal firing and to gas firing from coal firing.

11110 APTIC NO. 27669

Nagoya Municipal Office (Japan)

GUIDANCE GIVEN ON POLLUTION IN NAGOYA CITY, 1968. *(Nagoyashi kogai shido jokyo). Text in Japanese. 63p., March 1970.*

Complaints made during 1968 concerning pollution are outlined, showing an increase over the preceeding year of 9.4%. Since 1964, the total number of complaints has increased by approximately 12.5% each year, although the percentage of particular types of complaints to the total has remained almost unchanged: sooty smoke, 13-16%; dust, 8-12%; gas, 1-3%; odor, 11-13%; effluent, 2-4%; noise, 47-49%; and vibration, 9-12%. There were a greater number of complaints in areas with a higher concentration of buildings. More complaints were received during the summer months, particularly pertaining to noise, while complaints concerning sooty smoke were greater during the winter. Approximately 80% of the complaints concerned factories employing less than 49 workers. These smaller enterprises mingle with residences and, financially and technically, they find it difficult to take the necessary steps to prevent pollution. With respect to the smaller enterprises, 53.8% of the complaints pertained to noise, while there were more complaints about odors, gases, and effluents from the larger industries. According to the type of enterprise, 44.0% of the complaints concerned the manufacturing of metal products, 8.4% lumber and wood products, and decreased with textile, chemical petroleum and coal products, cement and others. More than half of the complaints were solved, while 1252 enterprises were inspected.

11111 APTIC NO. 27765

Dimitriades, Basil and Donald E. Seizinger

A PROCEDURE FOR ROUTINE USE IN CHROMATOGRAPHIC ANALYSIS OF AUTOMOTIVE HYDROCARBON EMISSIONS. *Environ. Sci. Technol., 5(3): 223-229, March 1971. 6 refs.*

Packed and open tubular columns in a gas chromatograph were used to separate the hydrocarbon content of automotive exhaust and gasoline vapor samples into 176 component groups within 30 min. The hydrocarbons were detected by a flame-ionization detector whose signals were processed by high-speed electronic integrators or magnetic tape recorders which yielded retention-time and peak-area data. Further processing of the data was accomplished semiautomatically using computer techniques. An evaluation of the chromatographic system's performance shows that it provides adequat resolution for obtaining usable estimates of the reactivity content of either exhaust or liquid fuel. In terms of retention time reproducibility, the system is sufficiently good to permit semiautomatic identification of chromatographic peaks from retention time data.

11112 APTIC NO. 27771

Spaite, Paul W. and R. E. Harrington

ABATEMENT GOES GLOBAL. *Power Eng., 75(2):42-45, Feb. 1971.*

During the past three years, engineers from the Air Pollution Control Office established both formal and informal lines of communication with major power producing nations and sought to identify collaborative opportunities. The 11 countries which share over 80% of the world's fossil fired generating capacity include the United States, USSR, Japan, Great Britain, West Germany, France, Italy, East Germany, Poland, Canada, and Czechoslovakia. Many countries or sections of countries have unique air pollution problems associated with fuel characteristics, quantity of indigenous fuels, unfavorable topographic and meteorological conditions, concentrations of power plants in limited areas, population densities, and particular sensitivities to particular pollutants. Problems due to particulate matter are discussed. Pollution control over particles is discussed, as well as the control of sulfur dioxide emissions and fuel desulfurization Although pollution control activities varied from countty to country, three general types of programs were found, ranging from the utilization of nuclear power to uncoordinated research and development.

11113 APTIC NO. 27777

Furuhama, Shoichi

ENGINES OF TODAY AND TOMORROW. *(Konnichi to asu no engin). Text in Japanese. Jidosha Gijutsu (Automobile Eng.), 25(1):31-37, 1971.*

Despite their potential for reducing air pollution from automobiles, rotary piston engines, Stirling engines, and hydrogen-fueled engines will not be competitive with the internal combustion engine for at least 5-10 yrs in terms of weight, operating costs, and ability to operate over a wide range of conditions. A new 500 cc rotary piston test engine, for example, has increased durability compared to an earlier 150 cc engine, but years of research will be required to bring its durability up to a level comparable with that of a reciprocating engine. Modifications incorporated in the new rotary piston engine include cast-iron housing, two ignition plugs instead of one, and for improved ignition, enlargement of the hole communicating with the ignition chamber. The main innovation, however, is a new lubrication system that prevents leakage of gas from the combustion chamber to the interior of the rotor thereby preventing thinning of the oil. This system has reduced lubricant consumption and prolonged engine life. At the same time, the 500 cc engine shows no increase in developed power and a marked increase in fuel consumption. With respect to antiknock characteristics, the rotary piston engine is no better than the reciprocating engine.

11114 APTIC NO. 27789

Ishii, Akio

HEATING AND AIR POLLUTION. *(Danbo to taiki osen). Text in Japanese. Sangyo Kogai (Ind. Public Nuisance), 7(2):15-21, Feb. 1971. 9 refs.*

Air pollution is defined and main causes for it are listed. Heatin is related to air pollution, particularly in downtown Tokyo, based on the consumption of heavy oil and coal as fuel for heating in the area. According to the author, heavy oil (C class) containing up to 3.5% sulfur content accounted for nearly 70% of the fuel used in the industrial district of downtown Tokyo for either industrial or heating purposes in the cold season. In another downtown district where office buildings were densely located such high sulfur content oil was only 6.7% of the fuel used. Heavy oil containing 3% or less sulfur accounted for 89.5% of fuel used in the latter district during the heating season. Although petroleum fuel for general household heating is subject to a very strict criterion for its sulfur content, which should be 0.08% or less, it constitutes one of the substantial air pollution sources when it is consumed in large quantities in a densely populated area like Tokyo. To describe more specifically air pollution caused by fuel consumption for heating, the author mapped a sulfur dioxide density distributio chart for a selected area of downtown Tokyo based on his estimates obtained through application of the Pasguill formulas. The basic data used for the estimates included volume of fuel consumption estimated from total floorage of buildings and houses located in and about the area, 3% sulfur content of fuel, neutral wind direction and 3 m/sec wind velocity. According to the map, SO2 of 0.35 ppm or higher covers 2.25 sq km of the area while the rest is almost entirely contaminated with that of 0.1 ppm or higher. Among the suggestions made by the author to prevent air pollution caused by heating are use of sulfur-free fuel such as city gas, liquefied petroleum gas and liquefied natural gas, and centralization of heating facilities for group uses.

11115 APTIC NO. 27790

Osaka Municipal Office (Japan)

OUTLINE OF EMERGENCY MEASURES TAKEN FOR AIR POLLUTION IN NISHIYODOGAWA WARD. *(Nishi-yodogawa-ku taiki osen kinkyu taisaku taiko). Text in Japanese. 13p, June 1970.*

Nishiyodogawa Ward is in the northwestern part of Osaka and borders on the industrial area of Amagasaki City. The area itself has been industrialized for a long time. Of the 794 enterprises, 60% are small, but in the coastal area, there are such big enterprises as iron and steel, chemicals, and so forth. About 140,000 kl of heavy oil is consumed in this area, 53.8% of it by the iron and steel industry, and 13.4% by the chemical industry. Throughout the year, northeast and westerly winds prevail, but especially the western wind in winter. Therefore, Amagasaki City contributes to air pollution. The area was designated as 'Air Pollution Special Area' in Dec. 1965. From 1966, exact surveys were carried out, to find the causal relationship between pollution sources and environmental concentration. It became imperative to decrease sulfur oxides concentrations and improve environmental conditions. The annual average of sulfur oxides in 1969 was 0.083 ppm, a much larger figure than 0.064 ppm, the average for Osaka City, and one failing to conform to the environmental standards in every respect. Dust concentration was average 0.197 mg/cu m a year, lower than the city's average of 0.209 mg/cu m. Much sulfur oxide is emitted by sulfuric acid manufacturing and sulfuric minerals handling enterprises. Amagasaki City uses more than 10 times the heavy fuel, mostly by thermal generating stations. The survey showed the damages amounted to approximately $3,360,000 a year to general households and enterprises. While damage to a household in Osaka City averages $39 a year, in Nishiyodogawa Ward it was $87, and damages to enterprises was $59 and $218 respectively. Incidence of chronic bronchitis in the ward is 8.9%, 4.5 times as much as in the rural part of the prefecture. There were 569 patients who were receiving relief under the law, as of May 19, 1970. The immediate target is to decrease the sulfur oxides concentration to a level less than the environmental standards or half of the present level at the end of 1971, by supplying low sulfur concentration fuel, inspecting the sources of pollution, and other measures. Six factories are going to be moved in 1970, and eight more in 1971, plus 3 factories which are the sources of noise. The factory sites bought up by the city will be used as parks, greenbelts, roads, and housing projects. Greenbelts are going to be installed in Nishiyodogawa Ward; the sewer system will be improved, air purifiers will be installed in schools, and a gargling solution is to be distributed among the school children.

11116 APTIC NO. 27997

Braxton, Henry G.

BENZYLIDENE BISPHENOL ACYLATE EXHAUST EMISSION REDUCING ADDITIVE. *(Ethyl Corp., New York, N. Y.) U. S. Pat. 3,547,958. 5p., Dec. 15, 1970. 1 ref. (Appl. Feb. 27, 1967, 9 claims).*

One source of hydrocarbons, which reportedly react with ozone to form photochemical smog, is the exhaust gas of internal combustion engines. Previous means of reducing exhaust emissions have concentration on secondary oxidation, either catalytic or direct flame, or unburned exhaust products, Previous attempts to reduce the initial hydrocarbon content of the exhaust gas and thus the need for secondary oxidation have concentrated on mechanical means such as improved carburetion. The present invention reduces exhaust emission and engine deposit formation through reducing additives--mono- and dialkanoates, aralkanoates, and benzoates of benzylidenebisphenols. The additives can be employed with liquid hydrocarbon fuels having a boiling range of from about 95 to 400 F.

11117 APTIC NO. 28095

Roberson, James E., E. R. Hendrickson, and W. Gene Tucker

THE NAPCA STUDY OF THE CONTROL OF ATMOSPHERIC EMISSIONS IN THE WOOD PULPING INDUSTRY. *TAPPI, 54(2):239-244, Feb. 1971. (Presented at the Technical Association of the Pulp and Paper Industry Engineerin Conference, Denver, Colo., Oct. 25-29, 1970.)*

An 18-month system analysis study of the wood pulping industry was undertaken to identify technical and economic problems related to the control of industry emissions and to assess the economic impact of air quality standards on the industry. The study involved the preparation of 17 flow diagrams for the three pulping processes (kraft, sulfite, and NSSC), engineering evaluations for a range of mill sizes for various control methods, and the development of a mathematical model to project investment and operating costs in the kraft pulping industry through 1980. The results are presented in tables of emissions and control costs for a hypothetical existing 500 tons/day mill and the same mill controlled to Oregon-Washington Standards. Based on the latest available data, current installatio and operating costs are also given for the industry. Total installed cost is approximately $166,000,000 for the kraft industry and approximately $900,000 for the sulfite industry. Net annual costs for the kraft industry is about $24,000,000, while in the case of sulfite a slight net return is indicated. The increased expenditures reported are not expected to diminish the projected pulp and paper production of more than double 1968 figures by 1985.

11118 APTIC NO. 28378

Robson, F. L., A. J. Giramonti, G. P. Lewis, and G. Gruber

ADVANCED POWER CYCLES AND NONPOLLUTING FUELS FOR UTILITY POWER GENERATION. *Gas Turbine Int., 12(2):22-24, 26-28, March-April 1971.*

Analytical studies were made to identify the technical and economic factors that will govern future selection of fuel cleanup processes and advanced cycle central power stations which, in combination, will be capable of producing electric power at the lowest possible cost while substantially reducing the emissions of sulfur oxide pollutants resulting from the combustion of high-sulfur coal and and residual fuel oil. While the hydrodesulfurization of residual fuel oil can produce a fuel which would meet the near-term NAPCA sulfur oxide emission goal of 1000 ppm in the stack gas, this fuel would be unsuitable for use in advanced cycle power systems since the combination of metals content and residual sulfur content would cause extensive corrosion at the temperatures likely to be encountered either on heater tube walls or on turbine blades. The gasification and desulfurization of coal to meet all NAPCA sulfur oxide emission goals could be accomplished with commercially available equipment, i.e., a Lurgi-type dry ash gasifier in conjunction with a hot potassium carbonate scrubbing system, but thre is a relatively high incremental cost for clean fuel from this system. During the next ten years, advanced cycle power stations utilizing combined gas and steam turbine (COGAS) power systems, and burning a gasified and desulfurized fuel, have the potential of not only reducing the emissions of sulfur oxides by over 99% compared to present day conventional power stations, but also producing electric power at significantly lower costs. Technology currently being developed for advanced aircraft gas turbine engines will suffice for the development of commercial base-load utility gas turbine systems with unit capacities as high as 500 Mw. Advanced cycle power stations based upon COGAS or base-load gas turbines have the potential of significant reductions both in thermal pollution and in nitrogen oxides pollution.

11119 APTIC NO. 28662

Muzio, L. J., E. S. Starkman, and L. S. Caretto

THE EFFECT OF TEMPERATURE VARIATIONS IN THE ENGINE COMBUSTION CHAMBER ON FORMATION AND EMISSION OF NITROGEN OXIDES. *Preprint, Columbia Univ., New York, Dept. of Mechanical Engineering, California Univ., Berkeley, Thermal Systems Div., and Imperial Coll of Science and Technology, London (England), Dept. of Mechanical Engineering, 43p., 1970. 17 refs.*

Temperature variation in the combustion chamber of spark ignition engines is a vital factor in determining exhaust pollutant concentrations. Oxides of nitrogen are particularly affected. The temperature and concentration variations were investigated both theoretically and experimentally. A nonuniform model of the combustion process was developed. Calculations based on this model show that a temperature difference of the order of 600 K can be established across the cylinder. The validity of this model was substantiated by results of infrared spectroscopic measurements in the operating engine cylinder. The kinetic mechanism for formation of nitric oxide was used, along with the non-uniform combustion model, to investigate the formation of nitric oxide in the cylinder. Results of the kinetic calculation show that the temperature gradient across the cylinder has a profound effect on the nitric oxide formation. The calculations are shown to be in agreement with results of direct cylinder sampling for a variety of engine variables including fuel-air ratio, spark timing and engine speed. (Author abstract)

11120 APTIC NO. 28666

Bobo, D. L., E. L. Keitz, J. Morris, and K. E. Yeager

A SURVEY OF FUEL AND ENERGY INFORMATION SOURCES. VOL. 1. *MITRE Corp., McLean, Va., Contract F19628-68-C-0365, Proj. 839C, Rept. MTR-1493, 297p., Nov. 1970. 43 refs.*

NTIS: PB 197386

Agencies which are sources of fuel and energy information are identified. In contacting the various agencies, four types of information were requested as follows: a functional description of the agency and its relevance to the fuel and energy survey; a description of the fuel and energy information which could be made available; a list of publications produced; and various unpublished information. Descriptions of the Federal and independent questionnaires which are used to compile fuel and energy information are presented.

11121 APTIC NO. 28692

Kuroda, Takashi

AUTOMOTIVE EMISSION GAS COUNTERMEASURES AND ROTARY ENGINE. *Haikigasu taisak no doko to rotari enjin). Text in Japanese. Kikai no Kenkyu (Science of Machine), 23(3):451-456, March 1971. 2 refs.*

The advantages and disadvantages of the rotary system engine from the standpoint of air pollution are discussed. The rotary engine is being recieved with keener interest because it is generally believed to be less air-polluting than a conventional reciprocating engine. Carbon monoxide, hydrocarbons, nitrogen oxides in automotive emission gases are deleterious to human health and are now subject to regulatory controls. An experiment indicated that the air fuel ratio at which CO and HC emissions were lowest, resulted in the highest emission values of NOx. An exhaust gas recirculation system is viewed as a possible solution to the NOx problem and may be combined with a thermal reactor to control CO and HC at the same time. Compared with a reciprocating engine, a rotary engine emits more HC but less NOx due to it

11122 APTIC NO. 28790

Fueki, Kazuo

A LOOK INTO ACTUAL STATE OF ELECTRIC AUTOMOBILE DEVELOPMENT. *(Denkijidosha no jittai o saguru). Text in Japanese. PPM (Japan), 2(4):2-7, April 1971.*

The present status of the electric automobile is surveyed. In the U.S. electric automobiles are viewed as economical second or third cars for short-distance driving e.g., commuting or shopping. Storage batteries, a key factor in the development of electric automobiles, are discussed. Both conventional batteries, including lead acid, nickel-cadmium, and alkali- manganese cells, and those still under development, including zinc-air, zinc-nickel, sodium-sulfur, lithium-chlorine, and lithium-halogen cells, are considered with respect to their advantages and disadvantages. It is noted that no conventional storage battery could serve as a power source to fuel a practical electric automobile; new storage batteries or fuel batteries are required to provide the higher energy density that conventional cells cannot yield. The hybrid system, or combination of fuel battery and storage battery, conceived as a possible solution to the problem of fueling an electric automobile with electric power is also touched on. Other topics covered include electric motors, body construction, and tires for electric automobiles. Future urban traffic systems, based on electricity-powered automobiles, proposed for the U.S. are cited. They included the 'Minicar System' developed by the University of Pennsylvania, the 'Urbmobile System' suggested by Cornell Aeronautics and Space Laboratory, and the 'Metrun System' of the Massachusetts Institute of Technology.

11123 APTIC NO. 28800

Korn, Joseph

SONIC FUEL ATOMIZATION. *Heating, Piping, Air Conditioning, 43(4):84-86, April 1971.*

Burners with sonic fuel atomizing nozzles are increasingly being used to reduce fuel costs while conforming to air pollution codes. Essentially, a sonic atomizing nozzle is a whistle. Gas expands through a convergent/divergent section and into a resonator cap, where it is reflected back to complement and amplify the primary shock wave. The result is an intense field of sonic energy, focused between the nozzle body and the resonator cap. By creating smaller, more uniform drops of oil and delivering them to a combustion chamber in the form of a soft mist, a sonic nozzle permits combustion conditions approaching stoichiometric to be achieved. With the basic combustion process improved, fuel consumption is reduced an average of 20%, smoke is minimized, and solid particulate emissions are cut by 80%. Combustion efficiencies of 83-87% and carbon dioxide levels of 14-16% are common even with heavy fuel oils.

11124 APTIC NO. 28806

Hodges, James L., Lubomyr Kurylko, and Robert F. McAlevy III

NITRIC OXIDE MEASUREMENTS IN A SIMULATED SPARK IGNITION ENGINE. *Stevens Inst. of Tech., Hoboken, N. J., Dept. of Mechanical Engineering, Rept. ME-RT-70008, 143p., Jan. 31, 1971. 70 refs.*

In order to determine the means by which nitric oxide is produced in engines, a device which simulates pertinent thermochemical engine processes was designed, tested and used to acquire relevant data. Both reproducibility and flexibility of the device exceed that possible with an engine, without sacrifice of the essential combustion aspects of the problem. An NO product gas monitoring apparatus was also developed which related absorption of ultraviolet radiation at the (0,0) gamma band of NO to the NO concentration in the combustion product gas a few seconds after combustion was complete. It was found that the mechanism by which NO freezes in the product gas does not appear to depend upon piston motion, but rather upon instantaneous local cooling resulting from radiation or the mixing of the inhomogeneous product gases. A time-resolved NO monitoring technique, intended to monitor NO concentration during and subsequent to the completion of combustion was devised and permitted acquisition of limited qualitative data. A review of related studies by other investigators is included. (Author abstract modified)

11125 APTIC NO. 28830

Huff, Paul B.

DAMAGE TO CITRUS BY FLUORINE AIR POLLUTION IN CENTRAL FLORIDA. *Citrus Ind., 40(3):12, 14, 16, 33, March 1959. 1 ref.*

In the spring and summer of 1949 a number of groves north of Bartow in Florida began to show tip burning, excessive leaf drop, and a chlorosis in the foliage that was not common to Florida citrus. Then it was noticed that a foggy, pale white, yellow smoke was coming from a new triple-superphosphate plant only about seven-tenths of a mile away. Another such plant went into operation in Polk County, and two citrus groves within three-fourth of a mile South-West of this plant were showing leaf tip burn, leaf drop, and the peculiar chlorotic pattern on the leaves. Losses are indicated. Analysis revealed that fluroine was present in the leaves. As each new triple-superphosphate plant opened and went into operation, the people noticed the native vegetation begin to die. The cattlemen noticed that calves were born too early. and often dead. Liberation of fluorine is discussed, as each ton of raw rock phosphate contains 60 pounds or more of fluorine. An experiment was conducted with Ruby Red Grapefruit trees to prove the cause.

11126 APTIC NO. 28838

Viles, F. J., Jr.

REVIEW OF CONTROL PROBLEMS IN OPERATIONS USING VARIOUS BERYLLIUM COMPOUNDS. *A. M. A. Arch. Ind. Health, 19(2):239-253, Feb. 1959. 8 refs.*

The conditions which give rise to airborne beryllium and the dynamics of beryllium contamination are presented. Volatilization and mechanical dispersion are mentioned. The theory of local exhaust ventilation for primary and secondary contamination control and the application of various types of exhaust hoods for point and multiple sources of contamination are reviewed. The following steps should be taken in investigating the need and type of control of beryllium operations: establish the need for ventilation by considering the vapor pressure of the materials used and the dust dispersion processes involved; determine the type of ventilation needed by considering the source of contamination, contaminant dispersion velocities, the mass of contaminated air inherent with the operation, restrictions in the amounts of exhaust air to be used, and secondary contamination and its control; establish the adequacy of control measures adopted by suitable air analyses. (Author summary modified)

11127 APTIC NO. 28844

Keck, James C. and David Gillespie

RATE-CONTROLLED PARTIAL-EQUILIBRIUM METHOD FOR TREATING REACTING GAS MIXTURES. *Massachusetts Inst. of Tech., Cambridge, Fluid Mechanics Lab., Illinois State Univ., Normal NAPCA Grant 1-R01-AP-01228-01, Fluid Mech. Lab. Pub., no. 71-2, 15p., Jan. 1971. 2 refs.*

In thermodynamics, gas dynamics, and chemistry, it is often necessary to determine the state of non-equilibrium gas mixtures in which a large number of reactions are occurring simultaneously. A rate-controlled partial-equilibrium method for treating reacting gas mixtures has been developed which is very much simpler than the usual technique of integrating the full set of rate equations. The method is based on the observation that a rate-controlling reaction is equivalent to a 'passive constraint' on the gas and that the corresponding partial-equilibrium state can be calculated by minimizing the appropriate free energy function. To illustrate practical application of the method, it was used to investigate the effect of finite three-body recombination and dissociation rates on the 'freezing' of carbon monoxide in internal combustion engines. (Author abstract modified)

11128 APTIC NO. 28861

Essenhigh, Robert H. and Ta-jin Kuo

DEVELOPMENT OF FUNDAMENTAL BASIS FOR INCINERATOR DESIGN EQUATIONS AND STANDARDS. *Pennsylvania State Univ., University Park, Combustion Lab., Contract 5R01 AP00397, TR. FS/PHS 8/69-4, 45p., Aug. 1969. 42 refs. (Presented at the Industrial Waste Conference 3rd Mid-Atlantic, 1969.)*

A review of existing standards for construction and operation of incinerators indicates two potentially important emissions. There is no requirement for minimum combustion intensity (though there is for maximum), or alternatively for minimum overfire jet momentum to ensure adequate mixing and maintenance of proper overfire combustio Neither is there any requirement for control of bed depth. Though generally less important than overfire air pressure, improper depth control can lead to intense smoke generation at one extreme, or to chanelling and underfire air bypass with excessive grit pick up at the other extreme. The analysis and discussion includes a general qualitative description and incipient physical model of combustion processes in an incinerator, with some components of the model also quantified, notably the combustion intensity and burning rates in the bed. Alternatively, the problem is represented in terms of control, that is: smoke and odor control achieved by complete combustion, good mixing, and low excess air; grit control-assisted by low bed and setting chamber velocities, and completed by stack gas cleaning; slag control affected by underfire air rate, wall composition, and degree of cooling; waste water quality control; and operational control, which becomes possible with adequate instrumentation. (Author summary modified)

11129 APTIC NO. 28862

Dreessen, Waldemar C., Thomas I. Edwards, Warren H. Reinhart, Richard T. Page, Stewart H. Webster, David W. Armstrong, and R. R. Sayers

THE CONTROL OF THE LEAD HAZARD IN THE STORAGE BATTERY INDUSTRY. *Public Health Bull. no. 262, 138p., 1941. 64 refs.*

Following a preliminary survey of 26 lead storage battery factories the working environment was investigated in 13 plants. Manufacturing processes were studied to find out what materials were used in each operation and what products and byproducts resulted. Air samples were taken at strategic locations to ascertain the atmospheric lead concentrations at the breathing level of workers. Samples were also taken under controlled and uncontrolled conditions to test the efficacy of control methods. In six of these factories, field offices and laboratories were set up and 766 male employees were examined. Blood specimens from each worker were divided for hematologic studies, chemical analysis of lead content, and a Kahn test; a urine sample was subjected to the usual chemical and microscopic tests. Nine men, all exposed to atmospheric lead concentrations in excess of 1.5 mg Pb per 10 cu m of air were diagnosed as cases of incipient plumbism. There were 168 men diagnosed as cases of lead absorption less affected than the cases of incipient plumbism. The prevalence of early plumbism increased with increasing atmospheric lead concentration. A study of the diagnostic value of several laboratory tests was made. Urinary lead concentrations correlated well with blood level concentration. Reticulotyte percentages (Osgood), stipple cell counts, and polychromatophilia were so related in their occurrence that if one of these types of cell was found to be abundant the other types were likely to be numerous also. Albuminuria was found twice as frequently among lead-affected workers as among nonaffecte workers. No relation was found between atmospheric lead exposure and the occurrence of arteriosclerotic-hypertensive heart disease. Three-plus or four-plus Kahn reactions were obtained in 2.2% of the workers. Equipment and practices found to be effective in reducing lead exposure are discussed.

11130 APTIC NO. 28871

Chamberlin, Richard I.

THE CONTROL OF BERYLLIUM MACHINING OPERATIONS. *A.M.A. Arch. Ind. Health, 19(2):231-238, Feb. 1959. 3 refs.*

Beryllium can be machined safely when a complete, well-defined occupational health program is instituted. The use of a high velocity, low-capacity ventilating system affords excellent control of the dust dispersed from machining operations, if the system is properly applied. This system consists of a 10 hp Spencer multistage vacuum producer, a tubular cloth bag type of separator which is 30-inches in diameter and has 51-sq ft of filter area, a 3-inch vacuum line to the shop, and a 5-inch vent line which extends to a point 5-ft above the roof. One and one-half inch outside diameter flexible hoses are used to connect the nozzle inle attachments to the main duct. Various lucite adapter nozzles have been fabricated for each machining operation. The only operations performed in the machine shop that are not completely adaptable to this type of small nozzle control are those of precision honing and deburring. To evaluate the effectiveness of the controls provided, beryllium air samples have been collected during each operation performed. The over-all occupational health program in effect at the laboratory includes medical control, good houskeeping, and educational phases, as well as the engineering and monitoring programs.

11131 APTIC NO. 28873

Starkman, Ernest S.

FORMATION OF EXHAUST EMISSION IN THE COMBUSTION CHAMBER. *Preprint, Federal International Societes Ingenieurs Technique de l'Automobile and*

Society of Automotive Engineers, New York, 21p., 1970. 14 refs. (Presented at the International Automobile Safety Conference Brussels, Belgium, 1970, Paper 15.3.D.)

A combination of optical methods and direct sampling of the combustion gases was applied to the cylinder of a spark ignition engine. The instantaneous concentrations of gases were studied. In addition to fixed species, such as carbon dioxide, carbon monoxide, and unburned hydrocarbons, the concentration of hydroxide was also measured. The formation of CO, NO, and unburned hydrocarbons and why they appear in the exhaust in relatively large quantities than simple theory predicts was determined. Engine variables as well as the effect of lead alkyl anti-knock agents were investigated. The effects of engine speed, spark timing, and fuel-air ratio are included. The influence of lead, both on the composition of gases in the cylinder as well as in the exhaust is reported. (Author summary modified)

11132 APTIC NO. 28885

Douglass, Irwin B. and Lawrence Price

SOURCES OF ODOR IN THE KRAFT PROCESS. II. REACTIONS FORMING HYDROGEN SULFIDE IN THE RECOVERY FURNACE. *TAPPI, 51(10):465-467, Oct. 1968. 9 refs. (Presented at the Technical Association of the Pulp and Paper Industry, Annual Meeting, 52nd, New York, Feb. 19-23, 1967.)*

The production of hydrogen sulfide during pyrolysis in the kraft pulping process was studied in the laboratory by heating inorganic substances assumed to be present in the black liquor at 600 C, first with soda lignin and then with glucose. In experiments using sodium sulfate and sodium sulfite, negligible amounts of hydrogen sulfide were formed. In experiments with elemental sulfur, sodium sulfide, and sodium thiosulfate, however, heating with soda lignin or glucose caused 30-75% of the inorganic sulfur to be converted to hydrogen sulfide. These result clearly indicate that large volumes of hydrogen sulfide are formed in a recovery furnace. If conditions for combustion are optimum in the furnace, this hydrogen sulfide will quickly burn to sulfur dioxide and water. The former will react with the alkali in the incoming black liquor and be retained. If the furnace is not operated properly, the hydrogen sulfide can escape to the atmosphere to become a major cause of air pollution. (Author abstract modified)

11133 APTIC NO. 28886

Zinn, R. E., C. R. LaMantia, and W. R. Niessen

TOTAL INCINERATION. *American Society of Mechanical Engineers, New York, Incinerator Div., Proc. Natl. Incinerator Conf., Cincinnati, Ohio, 1970, p. 36-39, 116-127. 13 refs. (May 17-20).*

Total incineration is defined as the conversion of refuse to solidified slag and flue gases, the latter including mainly carbon dioxide, oxygen, nitrogen, and water vapor. The slag byproduct represents the lowest possible volume of ash residue. Such stone-like slag does not require the large residue disposal site necessary for disposal of ash from present incinerators. Therefore, the total incineration plant can be located in a heavy industrial area and closer to the source of municipal refuse than the conventional incinerator. Six total incineration processes in various stages of development are compared with respect to type of furnace utilized, capital and operating costs, auxiliary energy required, potential nitrogen oxides pollution, relative size of air pollution control equipment, air preheated from recuperation, and shredding required. These systems are expected to require smaller and less costly air pollution control equipment than conventional incinerators, although the systems characterized by high gas velocities may require more efficient particulate removal devices. Operation of the total incinerator systems will require new and additional skills of plant-operating personnel. (Author abstract modified)

11134 APTIC NO. 28887

Achinger, W. C. and L. E. Daniels

AN EVALUATION OF SEVEN INCINERATORS. *American Society of Mechanical Engineers, New York, Incinerator Div., Proc. Natl. Incinerator Conf., Cincinnati, Ohio, 1970, p. 7-12, 32-64. (May 17-20.)*

Seven municipal incinerators built in the 1960's were investigated with regard to (1) quality and quantity of solid waste processes, residue, and gasborne particulate emissions; (2) quality of the fly ash collected and the wastewater produced; and (3) economics of incineration. The data obtained are compared and the study results summarized in tabular and graphic form. The incinerators functioned well in disposing of solid waste; reduction of volume and volatiles and the amount of heat released were greater than 94% in all cases and in some cases approached 99%. However, proper treatment and disposal of incinerator effluents were neglected at most facilities. Process waters were contaminated and particulate emissions were in excess of all but the most lenient air pollution emission standards. Labor costs were the major portion of operating costs for each plant. Capital costs varied widely without affecting the quality of the effluents. (Author conclusions modified)

11135 APTIC NO. 28894

THE NORWEGIAN-OWNED L.P.G. TANKER 'GASTON MICARD'. *Motor Ship, vol 45:63-67, May 1964*

Gas carrying arrangement and loading and discharging arrangements are reported for a 1500-ton dw tanker designed for the simultaneous transport of two different kinds of liquefied petroleum gas. Of welded construction, the tanker has six horizontal, cylindrical tanks in the main hold. The tanks are intended for liquids with a maximum specific gravity of 1.6 and maximum pressure of 9kg/sq cm. Pipelines for the loading and discharge of cargo are connected directly to tank domes, and there are three cargo-handling compressors that utilize nitrogen gas generated by a unit which burns ammonia by catalytic action. Safety provisions on the tanker include an automatic gas leak detector and alarm system.

11136 APTIC NO. 28897

Niessen, W. R. and S. H. Chanksy

THE NATURE OF REFUSE. *American Society of Mechanical Engineers, New York, Incinerator Div., Proc. Natl. Incinerator Conf., Cincinnati, Ohio, 1970, p. 1-24. 18 refs. (May 17-20.)*

Based on the projected annual growth rates of each of the 10 major categories of municipal refuse, per capita waste load and refuse composition for any given state in the U. S. are projected through the year 2000. Decreased refuse bulk density and increased refuse heat and volatile content should increase incinerator air pollution in the next 30 years. The total solid-waste load may be expected to increase by a factor of approximately 2.7. The total quantity collected in the 'State Economic Areas' is estimated to increase by a factor 3.4, or from 80 million tons in 1968 to about 270 million tons in 2000. This disposal burden will require additional incinerator capacity in balance with new and powerful waste-disposal and waste-recovery concepts. (Author abstract modified)

11137 APTIC NO. 28898

Wakefield, John W. and Earle P. Bisher

AIR POLLUTION CONTROL AND ITS EFFECTS ON OTHER ENGINEERING ACTIVITIES. *Eng. Progr. Univ. Florida Bull. Ser., 10(9):8-10, Sept 1956.*

Examples are cited to show how the art of air pollution control is apt to produce some water pollution and how water pollution control practices can cause some air pollution problems. For instance, water pollution is increased by treating emissions from the Kraft process or phosphate rock processing in stack washers or electrostatic precipitators, and a sewage treatment plant that treats water with a high sulfate content is a source of odorous hydrogen sulfide, even though the plant is well-designed and well- operated. One way to minimize the effects of air pollution control on water pollution is for industry to operate in a manner that will produce a minimum of pollutants requiring treatment.

11138 APTIC NO. 28945

Donaldson, Harry M.

PROBLEMS IN THE CONTROL OF OPERATIONS IN A BERYLLIUM-PROCESSING PLANT. *A.M.A. Arch. Ind. Health, 19(2):221-224, Feb. 1959.*

Problems of control of a beryllium processing plant are extensive and begin with the conception of the idea that the plant must be built. First of all, the plant must be located on a stream capable of carrying away any liquid wastes generated in the process and, like any chemical plant, it should preferably be built in a locatio where accidental contamination of the environment will not be a health hazard or cause property damage. Though many processes and many types of process equipment are available for the recovery of beryllium, the problem in choosing that process and that equipment which are capable of being controlled down to 2 micrograms per cubi meter is a major one. The next problem of importance after choosin the process and equipment that can be ventilated is to apply the principles of local exhaust ventilation to the equipment in such a way that contamination in the plant is limited to the stringent requirement of 2 micrograms Be/cu m. An extensive air cleaning system is necessary to keep outplant air at less than 0.01 microgra Be/cu m. All employees working in the plant are supplied with a complete change of clothing and are required to take a shower in order to keep beryllium from going home with the worker. Sometimes there are dermal problems which result from working with beryllium fluoride or ammonium beryllium fluoride. Other problems include the indoctrination of new employees as well as working with veteran employees. Both in-plant and out-plant sampling programs are never ending.

11139 APTIC NO. 28946

Pigford, C. A.

AIR POLLUTION. *J. Natl. Med. Assoc., 60(6):508-510, Nov. 1968. 5 refs. (Presented at the National Medical Association, 73rd Annual Meeting, Houston, Texas, Aug. 11-15, 1968.)*

It might be said that air pollution is the result of the metabolism of a high density population actively engaged in the diverse activities of a modern industrial society. The automobile of which there are more than 90 million in the United States is calculated to cause 65% of air pollution. Pulp and paper mills, iron and stee mills, petroleum refineries, smelters, inorganic chemical manufacturers and organic chemical manufacturers discharge a total of 23 million tons to the air annually. Power plants and space heating devices contribute a total of 28 million tons, while refuse disposal contributes approximately 5 million tons. Pollution contributes to urban decay and depreciation of property values, it causes injury to crops and livestock and in some areas has made certain types of farming impossible. Estimates have been made whic indicate that air pollution costs this country $65 per person per year, and this does not include medical costs incurred because of respiratory diseases. The association between air pollution and disease seems to be well established but basic cause and effect mechanisms are not well known, especially those of subliminal insults to the human organism. Rates of excretion, detoxification, metabolism, and deposition of toxic agents vary from individual to individual; demography, geography, sociology, and economics are factors to be considered in studying the effects of air pollution on human health. Air pollution episodes in Donora and London are cited. Carbon monoxide besides its known physiologic effects on th blood produces headache, loss of visual acuity, decreased muscular coordination, and in high enough concentrations--death. Effects of sulfur oxide, nitrous oxide, particulate matter, and photochemical smog are also indicated.

11140 APTIC NO. 28958

Libby, L. M.

FIFTY ENVIRONMENTAL PROBLEMS OF TIMELY IMPORTANCE. *Rand Corp., Santa Monica, Calif., 67p., Sept. 1970. 115 refs.*

NTIS, DDC: AD 712722

Comments from the current literature are compiled to illustrate some of the most recognizable and pressing problems of the environment. The 50 problems cited include heat pollution, weather modification by supersonic transport and stratospheric air force planes, environmental aspects of new housing techniques, the incidence of respiratory diseases, fuel oil spillage, sewage and solid waste disposal, eutrophication of lakes and streams, nuclear reactor locations, pollution and federal and civilian marine facilities, land reclamation, pesticides, and a pipeline in the Arctic. Suggestions are offered for the study of each problem.

11141 APTIC NO. 28959

Tulpule, A. H.

RECENT TRENDS IN VEHICLE USE IN THE UNITED STATES AND IN BRITAIN. *Ministry of Transport, Crowthorne (England), Road Research Lab., RRL Rept. LR 354, 21p., 1970. 19 refs.*

NTIS: PB 195348

Data for vehicle kilometers travelled in the United States in 1962 and 1967 are analyzed. Kilometers/vehicle tend to be slightly low in the U. S. with high levels of vehicle ownership. Growth rates of kilometers/vehicle also tend to be low in the U. S., which has high growth rates of vehicle ownership. The changes in kilometers/vehicle also depend on the rate of growth of income. Similar data for Britain in the years 1960 and 1966 show tendencies similar to those observed in the U. S., but the relationships are less marked. Some factors that would explain lower levels of kilometers/vehicle in Britain are discussed. The differences might be due partly to higher population densities and lower levels of capital investment in the road system in Britain and higher real running costs of vehicles in Britain. (Author abstract modified)

11142 APTIC NO. 28969

BUS WITH PHILIPS' STIRLING ENGINE. *(Omnibus mit Philips-Stirling-motor). Text in German. ATZ (Automobiltechnische Zeitschrift) (Stuttgart), 73(4):146. 1971.*

A bus with a Philips' Stirling engine was introduced in January 1971 in Germany. The bus has 31 passenger seats, is equipped with automatic gear and servo-stirring, and marked by a high degree of comfort. The engine has rhombic drives. Helium moves between hot and cold-temperature rooms. The Stirling engine has the advantage of being noiseless and of emitting less pollutants than other combustion engines. Carbon monoxide emissions are between 100 and 300 ppm, and nitrogen oxide emissions between 100 to 600 ppm. Hydrocarbon emissions are almost zero.

11143 APTIC NO. 28971

Orths, Kurt

ANNUAL REPORT 1970 OF THE INSTITUTE OF FOUNDRY PRACTICE. *(Jahresbericht 1970 des Instituts fuer Giessereitechnik). Text in German. Giesserei (Duesseldorf), 58(6):133-146, March 1971.*

An investigation conducted by the Institute of Foundry Practices indicated that of 183 cupola furnaces in operation in 93 foundries, 66% of the hot blast furnaces and 50% of the cold blast furnaces have dust collectors installed. Investment expenditures for furnaces of comparable size fluctuated between $3,750 and $75,000 and maintenance and operating costs between $.44 and $1.59. Most of the dust emitted by cupola furnaces has grain sizes below 5 micron. However, changes in the firing process will produce more readily collected sizes. The investigation also revealed that dust collectors in cupola furnaces with exhausters cause the stack temperature to rise to 600 and 1000 C. Subsequent examination showed that a stack has a much better updraft without a dust collector. With the dust collector and the exhauster in operation, too little cooling air is drawn in.

11144 APTIC NO. 28976

Bajusz, Alex J.

HYDROGEN SULFIDE. *Pollut. Eng., 3(1):17, Jan.-Feb. 1971.*

Hydrogen sulfide is present in most petroleum and natural gas deposits; it is a by-product of petroleum refinery operations; coal-coking operations; and the manufacture of carbon disulfide, viscose rayon, and kraft pulp. The gas is extremely hazardous because of its toxicity and explosive nature; the maximum safe toxic concentration is about 10 ppm while the explosive range of hydrogen sulfide in air is 4.3-45% at an ignition temperature of 250 C. Hydrogen sulfide can be measured continuously with an electrolytic titrator and removed by absorption into an alkaline solution or by wet and dry oxidation methods. The first type of process is used for gas streams containing large amounts of H2S with little or no carbon dioxide. The second group of processes treat gas streams with small amounts of H2S and a high proportion of CO2.

11145 APTIC NO. 28980

Aster, Ernst

AUTOMOBILES AT THE LEIPZIG FALL FAIR 1970. *(Kraftfahrzeuge auf der Leipziger Herbstmesse 1970). Text in German. ATZ (Automobiltechnische Zeitschrift) (Stuttgart), 73(3):102-104, 1971. 2 refs.*

Among the automobiles and trucks exhibited at the Leipzig Fall Fair in 1970, was the 'Wartburg 353', a product of the Eisenach automobile plant. The Wartburg 353 has front-wheel drive and a 992-ccm three-cylinder two-stroke engine with a 55 hp. It has four doors and seats 5 persons. Maximum speed is 130 km/hr. In the last year, the car's exhaust gas emissions were decreased by 50% and the power increased. Two limousine and two tourist models are available.

11146 APTIC NO. 29012

O'Mara, M. M., L. B. Crider, and R. L. Daniel

COMBUSTION PRODUCTS FROM VINYL CHLORIDE MONOMER. *Am. Ind. Hyg. Assoc. J., 32(3):153-156, March 1971. 9 refs.*

The combustion products of vinyl chloride monomer (VCM) were determined under both diffusion and premixed flame conditions. The temperature of the flame and the amount of soot generated in a VCM flame were also measured. For a VCM diffusion flame, the highest temperature recorded was 950 C; for a premixed flame, the highest temperature was 1466 C. The diffusion flame best simulates an actual VCM fire in that there is little premixing of air and VCM in the pre-ignition step of a flame. The minimum amount of soot produced during combustion was from 3 to 6% of the VCM consumed; this range corresponds to 7 to 15% of the available carbon in the VCM molecule. The VCM combustion gases contained 27,000 ppm hydrogen chloride, 58,100 ppm carbon dioxide, 9500 ppm carbon monoxide, 40 ppm phosgene, and VCM trace. From a hazard standpoint the gross quantity of HCL is the main source of danger in a VCM fire.

11147 APTIC NO. 29021

Egorichev, A. P., V. I. Staritskii, and L. M. Sumin

ORGANIZATION OF WORK ON ABATEMENT OF AIR AND WATER POLLUTION BY IRO AND STEEL INDUSTRY ENTERPRISES. *Steel (USSR) (English translation from Russian of: Stal'), no. 10:839-840, Oct. 1970.*

A summary is presented of recent Soviet scientific and technical achievements in the sphere of waste gas and water effluent cleaning at metallurgical works. In addition, problems still awaiting solutions are identified and suggestions made for disseminating the practical knowledge that has been gained by institutes and enterprises. Among the problems for which reliable solutions have been found are: cleaning open-hearth furnace gases with dry electrostatic precipitators and wet venturi-tube devices; oxygen- converter gas cleaning in large-diameter venturi tubes; gas cleanin on closed ferroalloy furnaces in two successive venturi tubes; gas cleaning by cyclones, cloth filters, or electrostatic precipitators; on refractories-industry furnaces during firing of magnesite, lime, and clay; cleaning of oily effluent by a flotation method; and clarification of effluent from metallurgical- furnace gas-cleaning systems with a magnetic coagulator.

11148 APTIC NO. 29024

Sisson, William

ESTIMATING AIR POLLUTANTS FROM STACKS. *Pollution Eng., 3(2):29, March/April 1971.*

Ambient air pollution levels are determined to a great extent by weather. Although the total discharge of contaminating materials to the atmosphere in a given location may remain the same from day to day, the degree of air pollution will vary widely. A table is presented for determining, in conjunction with the Bosanquet and Pearson equation, the maximum average ground-level concentrations for little air turbulence and the maximum distance from stack to point of maximum ground-level concentration.

11149 APTIC NO. 29044

Ueda, Toshihide

NECESSITY FOR DEVELOPMENT AND DEVELOPMENT PROJECTS OF ELECTRICALLY-DRIVEN AUTOMOTIVE VEHICLES. *(Denkijidosha kaihatsu no hitsuyosei to kaikatsu purojekuto). Text in Japanese. Jidosha Gijutsu (Automobile Eng.), 25(1):24-30, Jan. 1971.*

Domestic automobile manufacturers are urged to show more initiative in developing battery-fueled vehicles, since models introduced to date by electric power companies and battery manufacturers are simply modifications of the gasoline fueled automobile. Considering the complexity of an automobile, the development of a new automotive system requires high standards of technology and should be carried out only through the systems engineering method, for which participation of automobile makers is essential. The taxation system should also be revised to encourage such development, since the present system discourages development of an electrically-driven automobile because of some structural design limitations required to meet certain specifications necessary to obtain a lower tax. In addition, the commodity tax is imposed on delivery value; since the electric automobile already has fuel batteries built in at the time of delivery, it is therefore, high-priced. From a practical point of view, battery-fueled automotive vehicles should be developed and designed first for business use or for public transportation purposes, since the radius of their operation is usually standardized, the mileage comparatively limited, and a major source of air pollution is controlled. An essential element of development is a thorough reassessment of present battery-fueled automobile systems in order to discover the new automotive system most suitable for an electrically-driven vehicle. Immediate objects of research toward the development of battery-fueled automobiles include: prolongation of lead storage battery life (to 700 or more cycles); development of new types of storage batteries; development of meters indicating the residual quantity of electricity; development of a hybrid-fuel battery system; miniaturization and increased efficiency of the motor; development of a brushless dc motor or other new motor types; development of new control devices, including thyristor chopper-type speed controls, and automatic driving systems. A 5-year large-scale project for development of a battery-fueled automobile has been established which will start in fiscal 1971. The prototype will be developed in the first three years, and the final version will be completed by the end of the 5-year period.

11150 APTIC NO. 29049

FORD PLANT FILTERS NOXIOUS VAPORS WITH ACTIVATED CARBON SYSTEM. *Filtration Eng., 1(4):4-5, Dec. 1969.*

A vapor adsorption system utilizing buds of activated carbon pellets removes virtually all traces of trichloroethylene vapors produced by degreasing operations at a spark plug plant. In addition to two adsorption vessels, the recovery system consists of a blower and motor assembly, a water-cooled condenser, a water separator, and automatic controls. The system recovers from 400 to 450 gallons of condensed trichloroethylene vapors a day with a collection efficiency greater than 90%. Present operating costs are approximately three %, of the value of the solvent recovered.

11151 APTIC NO. 29057

WHAT A PETROLEUM COMPANY DOES FOR THE PROTECTION OF THE ENVIRONMENT. *(Was die Erdoelgesellschaft zum Shutze der Umwelt tut). Text in German. Chem. Rundschau (Solothurn), 24(11):200, March 17, 1971.*

In 1969, the Esso organization spent 24 million Swiss francs on the development of an automobile that emits practically no noxious exhaust gases. In addition, about 220 million Swiss francs were spent for research on environmental protection in general. A system was developed which reduces the toxic fraction in exhaust gases by 92%. In this sytem, unburned hydrocarbons and carbon monoxide are burned in a reactor or located in the exhaust pipe. Similar results were achieved with another system operating with the aid of a catalyst. Esso has used low-sulfur oils for most of its products so their sulfur content (1.2%) is far below the maximum allowable concentration (3.5% until June 30, 1971, 2% as of July 1, 1971). Esso heating oil has a sulfur content below 0.5%, 0.1% below the maximum allowable concentration valid until June 30, 1971.

11152 APTIC NO. 29062

Gloeckler, Otto, Norbert Rittmannsberger, and Hermann Scholl

FURTHER DEVELOPMENT OF THE ELECTRONIC CONTROLLED GASOLINE INJECTION 'JETRONIC'. *(Weiterentwicklung der elektronisch gesteuerten Benzineinspritzung 'Jetronic'). Text in German. Automobiltechnische Zeitschrift (Stuttgart), 73(4):126-132, April 1971. 17 refs.*

The 'Jetronic' gasoline injection system consists of an electrically driven fuel pump which transports the fuel and produces the injection pressure. The fuel is drawn from the tank through a filter and pressed into the pressure pipe where a constant fuel pressure is maintained. For injection, an electromagnetically operated injection valve is installed for each cylinder. To achieve low exhaust emissions, the injection valves are installed in the vicinity of the inlet valves. This new injection system makes it possible to meet U. S. regulations exhaust emission standards for 1970. Even more stringent restrictions on exhaust emission should be no problem with Jetronic injection systems, which already meet those for carbon monoxide. In the case of hydrocarbon emissions, the engine must be operated at a fuel-to-air ratio of lamda 1.0 to 1.2 where the minimum concentration of unburned hydrocarbons is found.

11153 APTIC NO. 29094

Butler, B. J.

TIPS ON CONTROLLING DRIFT. *Agr. Chem., 26(4):16-17, April 1971.*

The potential for pesticide drift increases with increased distance between the nozzle and the target, smaller spray droplets, higher wind velocities, and lower humidities. Nozzle-to-target distance can be decreased by keeping nozzles low, i.e., by avoiding wide nozzle spacings and narrow fan angles. Keeping nozzles low will also reduce wind effects. Droplet size is increased by operating at lower pressures, careful selection of nozzle type, use of thickeners in sprays, and not pointing nozzles forward on airplanes or on ground rigs as travel speed increases. The effects of low humidities are observed mainly when water-based sprays are used. On a low humidity day, these sprays evaporate as soon as they leave the nozzle. If the finer droplets don't strike their target quickly, they soon turn to floating dust.

11154 APTIC NO. 29096

Vogel, Hans

MAN, HIS ENVIRONMENT AND TECHNOLOGY. *(Der Mensch, seine Umwelt und die Technik). Text in German. Chem. Rundschau (Solothurn), 24(13):257, 259, March 31, 1971.*

Above our cities hovers a haze which absorbs about 20% of the sunlight. In such polluted areas, 20 to 30% of the children suffer from rickets. About 350 chemical compounds, some of which are extremely toxic, are contained in gaseous particulate and emissions. Among them are carcinogenic substances and substances toxic to the respiratory, circulatory, and nervous systems. The emissions stem from stacks, automobiles, and home machines. The haze above Tokyo is so dense that is residents rarel see the sun. Pollutants have been measured at a height of 14 km above cities in the United States. Even the poles and the deserts suffer from air pollution. Lead from automobile exhausts has been determined in arctic ice. Carbon monoxide and nitrogen oxides pollute not only air but also water. The higher carbon dioxide content of the ambient air causes climatic changes. The equilibrium between assimilation and dissimilation is disturbed. The oxygen background concentration is one the decrease because of its consumption by combustion processes.

11155 APTIC NO. 29098

McFarlan, A. I.

POLLUTION CONTROL VIA HEAT RECOVERY. *Bldg. Systems Design, 68(4): 31-34, April 1971.*

By requiring the unnecessary generation of heat and of energy to remove that heat, the simultaneous heating and air conditioning of large buildings is economically wasteful as used as a source of air pollution. This inefficiency is illustrated by an annual energy use record for a 300,000 sq ft, all electric office building in Los Angeles and by billing demand curves for compressors, space heating, and base loads for two typical winter days. In contrast, the combined heating and cooling energy consumption of a 392,000 sq ft also in Los Angeles building is reduced approximately 50% by a balanced heat recovery system. In the heat-recovery building, there is much more uniform power consumption over the 12 months of the year, always less than the nonrecovery system. At the same time, the heat recovery system reduces demand charges where electric heating and cooling are used in the form of heat recovery and transfer.

11156 APTIC NO. 29107

Lawrence, G. L.

EMISSION CONTROL BY CARBURATION. *Proc. Inst. Mech. Engrs. (London), vol. 183:24-33, 1968-1969. 5 refs. (Presented at Symposium on Motor Vehicle Air Pollution Control, London, England, Nov. 25-26, 1968, Paper 18.)*

Basic data and information based on a year's operating experience are presented for the CDSE air valve carburetor and the Duplex manifold system. The carburetion process represented by this equipment is characterized by upstream (of the inlet valve) conditioning of the induced change. Such conditioning is noted to be more logical and viable than alternative treatments for control of hydrocarbons and carbon monoxide, where pollutants are allowed to form to provide fuel for their eventual combustion in the exhaust system. CDSE carburetors were applied over a large number of engines of different manufacture, ranging from approximately one to six liter capacity in both. The results, which are summarized in tabular and graphic form, demonstrate that this carburetion process is potentially capable of reducing emissions to the U. S. 1970 standards.

11157 APTIC NO. 29145

DeCorso, S. M.

FIRING GAS TURBINES TO REDUCE POLLUTION. *Power, 115(5):56-57, May 1971.*

Gas turbine manufacturers can help control smoke pollution through proper design of combustor features influencing either the local fuel/air ratio or carbon content. Pressure loss in the combustor system is one of these variables. Increase in pressure drop generally decreases smoke formation because of the increase in large-scale turbulence and mixing of primary air with fuel. Increase in combustor-discharge temperature also cuts smoke formation. Fuel should not be a smoke problem when distillates with a normal aromatic content of 30% are burned. Increasing attention is being given nitrogen oxide emissions from turbines, and much work in progress is aimed at developing reliable test data on nitrogen oxide levels. Sulfur dioxide in turbine exhaust is best controlled by limiting the sulfur content of fuel.

11158 APTIC NO. 29161

Schultz, Morton J.

YOUR POLLUTION-FREE CAR OF 1975–WHICH ENGINE WILL DRIVE IT? Sci. Dig., 69(5):48-54, May 1971.

The Clean Air Act calls for a 90% reduction in all noxious exhaust gases emitted by 1970-1971 model automobiles. Included are the nitrogen oxides which are produced in volume by the high heat of the 1970-1971 engines. Engines under serious consideration for the 1975 models are the stratified charge engine, an improved Wankel rotary engine, the Rankine cycle steam engine, gas turbine, steam turbine, and a gas-electric hybrid. Of these engines, the stratified charge may well be the one adopted by the automobile industry. In this internal combustion engine, a precise fuel-air mixture is burned at the exact location inside the cylinder to achieve maximum combustion and minium waste emission. Equipped with a catalytic converter and exhaust gas recirculator, the stratified charge engine should reduce hydrocarbons by 98%, carbon monoxide by 94%, and nitrogen oxides by 93%.

11159 APTIC NO. 29171

Hochgesand, G.

RECTISOL AND PURISOL. *Ind. Eng. Chem., 62(7):37-43, July 1970. 11 refs. (Presented at the Symposium on Novel Processes and Technology of the European and Japanese Chemical Industry, ACS Meeting, 158th, New York, Sept. 7-12, 1969.)*

Syngas is the manufacture of gases consisting mainly of hydrogen and carbon monoxide. For purification, sulfur and carbon dioxide must be removed. Flash desorption, regeneration by stripping, and hot regeneration are the main absorption and desorption methods used for high pressure syngas production. The circulation rate is almost proportional to the investment and operating costs. Also, organic solvents, such as methanol and N-methyl-pyrrolidone, can be used to absorb H2S and CO2. The Rectisol and Purisol method for CO2 and H2S absorption have special advantages for the manufacture of sytheis gases at medium to high process pressures. They allow optimum solutions for the overall scheme by providing extreme purities, wide use of inexpensive regeneration by flashing and stripping, and the ability to process gas quantities of 150 million std cu ft/day and more in a single train. In addition, the operation of these processes is simplified considerably by the absence of chemical reactions. There are no serious problems regarding corrosion or degradation of the organic solvents, and the process control is restricted mainly to pressures and temperatures. (Author conclusions modified)

11160 APTIC NO. 29181

Takamatsu, Takeichiro, Masakatsu Hiraoka, Y. Ikeda, and Toshihiro Kitada

MATHEMATICAL MODEL FOR CONCENTRATION OF AIR POLLUTION. *(Taiki osen nodo keisan no tame no sugaku moderu). Text in Japanese. Taiki Osen Kenkyu (J. Japan Soc. Air Pollution), 5(1):119, 1970. 2 refs. (Proceedings of the Japan Society of Air Pollution, Annual Meeting, 11th, 1970.)*

Studies were conducted on methods of calculating the concentration of sulfur oxides from multiple emission sources in an urban area. An equation is introduced for the concentration of pollutants from distant areas in the atmosphere above a monitoring station. Among the variables are point and areal emission intensities, wind velocity, pollutant emission intensity at the mixing zone, height of the space around the station in which complete mixing is assumed to occur, and dissipation rate constant. The height of the mixing zone was estimated to be about 150 m. Gamma, the parameter that represents the mixed forces in the vertical direction, wase estimated based on ground-level wind speed data. The regression formula of the parameter and its statistical analysis are presented. The regression equation did not show high multiple correlation because atmospheric stability was mainly estimated from ground-level wind speed data. The equation was assumed to be linear initially, and atmospheric turbulence is a very complicated phenomenon.

11161 APTIC NO. 29228

NG/SNG HANDBOOK. *Hydrocarbon Process., 50(4):93-112, April 1971. 20 refs.*

The most outstanding processes used in the natural gas and substitute natural gas (NG/SNG) industry are described. Process options for drying, sweetening, recovering NGLs, manufacturing liquefied natural gas and helium, removing carbon dioxide and nitrogen, and for making SNG from coal, shale, and oil can be reviewed quickly with the data presented. The following specific processes are described with information on applications, use, economics, licensors, and commercial installations: Adip, adsorption drying, Benfield, CRG, CRG hydrogasification, CRG methanation, denitrogenation, Econamine, fluidized bed hydrogenation, Fluor Solvent, Giammarco Vetrocoke (CO2), Giammarco Vetrocoke (H2S), Girbotol, helium extraction and nitrogen rejection, high dewpoint depression dehydration, HYGAS, JGC methane-rich gas, LNG, Modified Claus, molecular sieves, Purisol, recycle hydrogenation, refrigerated absorption, SELEXOL, SNPA-DEA, Stretford, Sulfinol, Sun/Thermal, and Turbo-Expander.

11162 APTIC NO. 29236

Hishida, Kazuo and Hisao Nihei

CONTROL FOR CERAMICS FURNACE (GLASS MELTING FURNACE) FROM VIEWPOINT OF EXHAUST GASEOUS PROPERTY. *(Chitsugyoyo (garasu yokairo) ni okeru baien no seijo to taisaku). Text in Japanese. Taiki Osen Kenkyu (J. Japan Soc. Air Pollution), 5(1):182, 1970. (Proceedings of the Japan Society of Air Pollution, Annual Meeting, 11th, 1970.*

Glass melting furnaces were investigated. The first furnace examined was a square crucible furnace with a rotary burner. The amount of dust averaged 0.5 g/N cu m, with a maximum of 1.06 g/N cu m. About 50% of the collected dust was incompletely combusted carbon, and average particle size was 10-20 micron. Ordinary combustion at an air ratio of 1.04 was adequate in terms of heat management, but the black smoke emitted (4-6 pm) indicated that there was not enough air. To reduce emissions, close attention should be paid to heat management inside the furnace, furnace pressure, and furnace maintenance. Also, thermometers should be used. Particle size distribution in dust collected by a cyclone from a glass working furnace was investigated. The main components were carbon black particles of less than 0.1 micron. The average size was 15 micron, although 8-10 micron is a more likely figure. A small aperture multicyclone would be adequate to keep the exit dust concentration at around 0.1 g/N cu m.

11163 APTIC NO. 29295

Carr, J. F. and R. T. Jarman

TECHNIQUES FOR MEASURING SOLIDS CONCENTRATIONS IN CHIMNEY GASES FRO OIL-FIRED POWER STATIONS. *J. Inst. Fuel (London), 44(360):33-37, Jan. 1971. 7 refs.*

The use of filament glass-fiber thimbles and quartz-packed wool cartridge filters in measuring particle concentration in stack effluents at oil-fired power stations is discussed. Also described are cascade impactor and wire grid (sieve) methods of determining the size distribution of the particulate matter; these methods yield volumetric solids concentrations as well as size information. The results obtained by the four methods at four oil-fired stations are tabulated. The accuracy of the filter thimble was found to be limited by the low dust burdens produced by oil firing. At stations having very efficient gas-cleaning equipment, better results are obtained with the cartridge device. Size determinations by the cascade impactor and sieve methods were in good agreement. However, the reduced collection efficiency of the wires for particles below 5 micrometers might limit their accuracy for some applications other than plume visibility studies.

11164 APTIC NO. 29308

DEVELOPMENT TRENDS: HEATING BOILERS OF STEEL AND CAST IRON. *(Entwicklungstendenzen: Heizkessel aus Stahl und Gusseisen). Text in German. Oel Gasfeuerung, 16(3):278-286, 1971.*

In large cities there is a tendency to use natural gas for firing boilers in order to keep emissions low. Since this gas is difficult to ignite, ventilating burners are used which have a higher noise level. Atmospheric burners with capacities of 200,000 kcal/h are used. In small boilers of 70 mcal, the heat quantity transferred through radiation in the combustion chamber is relatively high (up to 70%), so that only small heating surfaces are needed for the transfer of heat from the flue gases after they leave the combustion chamber. Cast iron furnaces are also heated with natural gas instead of oil to curb air pollution. An increase of the waste gas temperature of 10 to 15 C was observed at boilers fired with natural gas, compared to oil-fired units.

11165 APTIC NO. 29309

Henning, Herbert and Siegfried Kliemann

PRECIPITATION AND FOG FORMATION THROUGH COOLING TOWERS. *(Niederschlags- und Nebelbildung durch Kuehltuerme). Text in German. Energie Tech., 23(3)87-89, 1971.*

Wet cooling towers cause fog and precipitation during certain weather conditions. During cold weather they may also be the cause of ice formation on surrounding streets. The plume leaving the cooling tower contains cooling water which circulates in the tower. The extent of droplet emission by a cooling tower depends on the air throughput, the air throughput speed, the rain density, and the type of droplet spectrum. When the parameters are constant, the droplet emission is proportional to the air throughput. The doubling of air throughput speed causes a doubling of the droplet emission. Droplet emission can be only moderately reduced by reducing the air throughput and the air throughput speed and by influencing the droplet spectrum. In ventilator cooling towers, droplet collectors must be installed; for natural draft cooling towers they are not always necessary. Filters and cyclones are rarely used in cooling towers. The droplets are commonly collected by deflection, that is, primarily the heavier droplets are removed from the gas flow by this method. Because the heavy droplets cause most of the precipitation, the method is an efficient one.

11166 APTIC NO. 29331

Nakagawa, Tonomo

DEVICE TO INCINERATE RUBBER AND SYNTHETIC RESINS THAT EMIT SMOKE. *(Gomu, gosei jushi nado taensatsu busshitsu no shokyaku sochi). Text in Japanese. (Nakagawa Kogyo Co., Ltd. (Japan)) Japan. Pat. Sho 44-2150. 6p., Jan. 29, 1969. (Appl. April 5, 1965, claims not given).*

The device described completely incinerates rubber and synthetic resins, and emits only colorless and transparent gases free from soot and black smoke. The incinerator interior is covered with fireproof bricks, and under a top opening is a bin which stores the material to be burned. Grids are provided onto which the liquefied drops of material fall. At the bottom of the fuel storage chamber, is the first incineration chamber, whose roof ignites; it narrows to lead leads to the second incineration chamber. At the most narrowed point is an opening to supply a jet of air, to the incompletely burned gas that pass through the first incineration chamber. The second incineration chamber includes a smoke duct which is opened to emit the exhaust gas. The equipment is compact, simple to handle, inexpensive, and can be used in urban areas. A gas cleaning device can be attached to eliminate sulfuric and chlorine gases.

11167 APTIC NO. 29332

Hiraike, Makoto

GARBAGE INCINERATOR. *(Jinkai shyokyaku sochi). Text in Japanese. (Kawasaki Heavy Industries (Japan)) Japan. Pat. Sho 43-27320. 2p., Nov. 25, 1968. (Appl. Feb. 8, 1965, claims not given).*

This invention is a modification of another incinerator, (Japan. Pat. Sho 39-35987) that suffered from highly odorous low temperature exhaust gas and other problems. To eliminate those defects the low temperature exhaust gas from the outlet of the crusher-drier is led into a supplementary incinerating chamber provided in the smoke duct of the incinerator, which is heated to a high temperature. Organic materials and heavy oils are burned in this supplementary chamber. The steam is eliminated in the form of vapor. Thus odor is eliminated and the exhaust gas is led into a simplified wet-type dust collector before discharge to the atmosphere. Wet and odorous garbage is completely incinerated. The incinerator is suitable for industrial use.

11168 APTIC NO. 29333

Sasaki, Yoichiro

INCINERATOR. *(Jinkai shokyakuro). Text in Japanese. (Assignee no given.) Japan. Pat. Sho 40-9597. 5p., May 17, 1965. (Appl. Nov. 26, 1962, claims not given).*

A garbage incinerator is described which completely incinerates not only dry trash but also garbage with considerable water content and sundry mixed wastes. The incinerator, vertically cylindrical i form, has numerous semi-spherical convexes on its inner walls. When the flame from the bottom of the incinerator laps the wall, these convexes trap the heat and by multiple reflection, dry the trash to permit its incineration high efficiency. In order to avoid excessive trash from piling up on top, the water content of the trash is gradually dried and dropped by stages to the bottom of the incinerator to ensure continuous incineration. The heat emitted is utilized in burning the trash and the gas or smoke emitted is reburned so that smoke emissions are minimal. In a long smoke duct connecting the incinerator and chimney stack, there is a chamber for reincineration which burns the chemical material or trash impregnated with oil; with the long flame from this incineration, the smoke duct is heated to completely burn any unburned gases from the incinerator. The clinker that accumulates on the bottom of the incinerator is automatically crushed to improve the incineration efficiency.

11169 APTIC NO. 29336

Muraki, Naotake and Nobuaki Kojima

DIESEL ENGINE EMISSIONS, CHARACTERISTICS AND CONTROLLING MEASURES. *(Diiseru enjin no haiki no tokushitsu to sono taisaku). Text in Japanese. Jidosha Gijutsu (J. Soc. Automot. Engrs. Japan), 25(3):267-275, March 1971. 8 refs.*

Diesel engine emission gases were analyzed using four different types of engines. The results obtained on nitric oxide, hydrocarbons, carbon monoxide, and carbon particles from the emission gas were compared with coefficients of the U. S. Dept. of Health, Education, and Welfare, 1967, representing the emission of a particular substance (measured by weight) in relation to fuel consumption (by volume). The HC emission coefficient given by HEW was found to be four times greater than what test results indicated. CO emission greatly varied with load variation. Measurement of carbon particles with a smokemeter showed that the HEW emission coefficient for carbon particles was again too high. The HEW standard for carbon particles emission is concluded to be unrealistic, and one-tenth the HEW figures should be the practical coefficient. Microscopic observation of the balck smoke which indicated that the particles condense into larger sizes by wetting and collision in the exhaust pipe. Nitric oxide density is discussed in relation to the combustion system of the engine. Several control measures for black smoke, NO, and other harmful substances are also discussed.

11170 APTIC NO. 29345

Henderson, R. D.

EARTHMOVERS POLLUTE LITTLE BUT FACE EMISSION STANDARDS. *S.A.E. (Soc. Automot. Engrs.) J., 78(5):35-36, May 1970. 1 ref.*

Diesel-powered earthmoving equipment produces relatively insignificant emissions when compared with the automobile, but now regulations are being adopted for construction equipment at the same level as on-highway trucks. The quantity of pollutants emitted by earthmoving vehicles is given with data on average life, average hours of operation per year, and average load factor. In 1969, earthmoving vehicles gave off 61,000 tons of hydrocarbons; 181,000 tons of carbon monoxide; and 414,630 tons of nitrogen osides, while automobiles gave off 12,000,000; 66,000,000; and 6,000,000 tons respectively. Most diesel regulations are only directed to reducing visible smoke. Also, most, including the 1970 Federal Standard, apply only to diesels used as heavy-duty motor vehicles. In California, violation tickets are now given if smoke exceeds a level of Ringelmann 1. Utah prohibits smoke darker than Ringelmann 1 while moving 100 yd or for more than 3 min if stationary for vehicles built after January, 1971 or Ringelmann 2 for those built before this date.

11171 APTIC NO. 29348

Spliethoff, H.

STUDIES ON SLAG TAP FURNACES. *(Verhaltensuntersuchungen an Schmelzkammerfeuerungen). Text in Ger-*

man. Mitt. Ver. Grosskesselbesitzer, 51(1):8-16, 1971. 7 refs.

Combustion can be understood as a network with fuel and air flows as initial parameters and the carbon monoxide and oxygen concentrations of the waste gases, the combustion chamber temperature, and the flue gas flow as the parameters at the opposite end. Excess air or lack of air and combustion chamber temperature directly or indirectly influence the combustion conditions. Carbon monoxide develops during any combustion process but is not damaging or corrosion-producing as long as it does not occur outside the combustion process. If approximately equal O2 concentrations are measured at the various measuring points at the end of the combustion process independent of the load, the combustion process can be better regulated and handled more economically. From this it cannot be concluded however, that a constant O2 supply to one point yields the same results.

11172 APTIC NO. 29353

Higginson, A. E.

THE DISPOSAL OF REFUSE BY INCINERATION.

Public Cleansing (London), 61(3):100-117, March 1971. (Presented at the National Society for Clean Air Conference, Southport, England.)

Most municipal incinerators burn a mixture of domestic, commercial, and some industrial refuse which produce pollutants. The amount of pollution depends on the nature and proportion of any special wastes, the efficiency of the combustion process, gas cleaning techniques, and the dispersal height of the chimney. The combustion of plastics produces pollution in the form of dark smoke and odor. Two major kinds of plastics are thermoplastics which can be heated and softened repeatedly and thermosetting that can be moulded only once. The most important incinerator statutes are provisions of the Clean Air Acts of 1956 and 1968 which deal with the control rate of emissions of dark smoke, grit, and dust from the combustion process. Other aspects are covered under the Public Health Act of 1939 and the Alkali Works Regulation Act of 1906. Noise can also be a pollutant; the recommendations of the Wilson Committee can be used as standards. Stack height can effect the dispersion of dust and gas. Mathematical formulae have been devised to calculate the plume rise, wind speed, and effect on ground level pollutant concentration, but geophysical factors must also be used. The Civic Amenities Act of 1967 controls the disposal of bulky waste. Its size may cause problems and require additional manual attention or shredding. When burning bulky waste, care must be taken in charging the incinerator, temperature and turbulence must be sufficient, and ample oxygen is required. Industrial and sewage sludge can be odorous and difficult to dispose. Factors such as the waste calorific value, weight, moisture content, and volume must be known to properly build and use an incinerator. Gas cleaning can be achieved by electrostatic precipitators, scrubbers, and cyclones. Some standards, instrumentation, and costs are also discussed. Another problem is the disposal of fly-ash which remains after incineration. All waste and sewage is potential raw material for organic humus and inorganic land fill.

11173 APTIC NO. 29355

Nishida, Konosuke, Tsuneo Honda, Yoshinori Ishikawa, and Susumu Takada

STUDIES ON AIR POLLUTION DUE TO AUTOMOBILE EXHAUST. REPORT 14. DIFFERENCE ON DRIVING PATTERN BY TRAFFIC AND ROAD CONDITION.

(Jidosha haiki ni yoru taikiosen no kenkyu. (Dai 14 ho) Kotsuryo to dorojoken ni yoru soko patan no henka). Text in Japanese. Nippon Eiseigaku Zasshi (Japan J. Hyg.), 26(1):132, April 1971. (Presented at the Japanese Society for Hygiene, Annual Meeting, 41st, Tokyo, April 3-4, 1971.)

Driving tests were carried out on roads of different widths and traffic volume in order to calculate the total amount of auto exhaust gases in a region throughout Kyoto. The most adequate driving cycle was studied. The amount of exhaust gas for different cycles were based on the actual measurement of carbon monoxide under different speeds. The total amount of exhaust gas and the number of automobiles were used to determine the total city gas levels. On equally wide roads, the idle hours increased as the traffic volume increased, while the hours of acceleration and constant speed decreased. On wide roads, the number of steps from idle to idle decreased as the traffic volume increased, but on the roads below 20 m wide, the number of steps were comparatively large Thus, idling at low speeds continues for quite a long time in narrow streets and the amount of exhausted CO is quite high. The amount of exhausted CO at the center of Kyoto city was 2.0 t/km/hr, which was the highest recorded.

11174 APTIC NO. 29364

Kimura, Motoo

AUTOMOTIVE FUELS AND AIR POLLUTION BY AUTOMOTIVE EMISSION.

(Jidosha yo nenryo to haishutsu gasu taiki osen). Text in Japanese. Jidosha Gijutsu (J. Soc. Automot. Engrs. Japan), 25(3):303-314, March 1971. 28 refs.

Air pollution caused by automotive emission was reviewed with emphasis on the automotive fuel, gasoline. It is suggested that de-leading and other increasingly severe requirements imposed upon the gasolines lack definite scientific grounds in Japan, and no definite conclusion is yet available either on the relationship between the constituents of fuels and those in automotive exhaust gases or on the effects on human health of lead compounds contained in the exhaust gas. Various studies on carbon monoxide, hydrocarbons, and nitrogen oxides in automotive emissions are reviewed. Since HC is an important constituent in photochemical reactions, the total reactivity against the quantity of aromatics in the fuel is discussed. It is indicated that the reactivity remains practically unaffected by the quantity of olefin in the fuel, and that the photochemical reactivity of the exhaust gas is not notably affected by fuel composition. The effect of tetra-alky lead and of de-leading gasolines is discussed. The emission of lea compounds from automotive engines is described. The negative factors resulting from the de-leading of gasolines such as valve recession and the subsequent increase in the cost of automotive fuel are emphasized.

11175 APTIC NO. 29373

Popovici, N., P. Potop, L. Brindus, and S. Nicolescu

PROCESS AND PLANT TO RENDER VALUABLE SO2 AND NH3 WASTE GASEOUS COMPONENTS PRODUCED BY A COMPLEX FERTILIZER PLANT.

Chem. Oil Gas Rom., 7(1):21-29, 1971. 1 ref.

A new process for reducing sulfur dioxide emissions generated by sulfuric acid production at fertilizer plants is described. The process is based on retaining SO2-end gas in an ammonium sulfite-bisulfite solution that is obtained from plant ammonia gas releases. This solution is decomposed by phosphoric or sulfuric acid, following which SO2 gases are returned to the sulfuric acid plant. The acid product containing ammonium salt obtained from decomposition of the sulfite-bisulfite solution joins the process flow for producing complex fertilizers. The process has the advantage of increasing the 98% conversion of SO2 to SO3 achievable with double catalysis or intermediate absorption catalysis to 99.6%. The process is also superior in terms of costs and equipment requirements. Operating data are presented for a commercial plant processing 45,000 N cu m/hr SO2-end gas.

11176 APTIC NO. 29401

Miyadai, Seiji

MOBILE INCINERATION. *(Ido jinkai shokyaku). Text in Japanese. (Assignee not given.) Japan. Pat. Sho 37-17088. 3p., Oct. 22, 1962 (Appl. Dec. 17, 1960, claims not given).*

The mobile incinerator described is shaped like a drum, mounted across the width on the rear of a truck, and is combined with a water tank and an atomizer chamber built on the back of the truck. A garbage receiving box suspended from the rear end of the truck chassis is connected to the incinerator by means of a belt conveyor. In the receiving box a filter screen is linked with the shaft of the belt conveyor roller by means of a crank so that the filter screen may move back and forth for filtering action as the conveyor is driven. The water tank is equipped with a cooler pipe with one end connected to a smoke duct from the incinerator via an air pump. The other end of the cooler pipe is connected to another smoke duct running into and opening in the atomizer chamber where water atomizer consisting of a few pipes with ejection holes is installed in the upper part. The atomizer is connected, via water pump, to the bottom of the water tank by means of a water pipe. A smoke discharge port is in the rear side of the atomizer chamber. Garbarge thrown into the garbage receiving box is filtere by the filter screen and carried upward into the incinerator by means of the belt conveyor and incinerated in the incinerator. Smoke and gas inhaled from the incinerator is blown into the cooler of the water tank by means of the air pump. As the smoke goes through the cooler pipe, it is cooled and flows into the atomizer chamber while its pyroligneous acid content is separated and discharged separately. Meanwhile, water is pumped up from the water tank into the atomizer, which atomizes water into the atomizer chamber to scrub the smoke before emission to the atmosphere. The smoke so purified is then discharged through the smoke discharge chamber. Under the atomizer is a screen net provided to hold water steady against shocks and vibration especially when the water has filled the chamber to a considerable height.

11177 APTIC NO. 29407

Masuda, Tokio

INCINERATOR. *(Jinkai Shokyakuro). Text in Japanese. (Masuda Kogyo Co., Ltd. (Japan) Japan. Pat. Sho 40-27637. 2p., Dec. 6, 1965. (Appl. Oct. 12, 1963, claims not given).*

The device described, designed for kitchen garbage consists of two incinerating chambers and a jet-type smoke elimination chamber. When the garbage is dumped into a basket grid in the first incinerating chamber, it falls to the right side of the basket, accumulates, and is heated. The blower is rotated thus jetting the air through the nozzle. The air inside the smoke elimination chamber and the second incineration chamber is sucked in so that there is draft in the first chamber, and incineration occurs. The residual carbonated material is completely burned. At a suitable time, a partitioning rod is tilted, and there is room for another batch, which is dumped to the left hand side of the first chamber. With the heat and draft in the right hand side, the water from the garbage is evaporated, and the garbage is burned. The gas emitted during burning is mixed with the air and complete re-combustion takes place in the second incineration chamber.

11178 APTIC NO. 29408

Hirai, Yoshimi, Shinichi Yamamoto, Yiromichi Akahane, and Mitsuharu Nakahara

CONSTITUENTS OF EXHAUST GASES FROM AUTOMOTIVE GASOLINE ENGINE. *(Gasorin enjin no haikigasu no sosei ni tsuite). Text in Japanese. Jidosha Gijutsu (J. Soc. Automot. Engrs., Japan), 25(3):249-259, March 1971. 31 refs.*

The effects of engine operation, design, and construction of gasoline composition, and of the air/fuel ratio on automotive exhaust gases are discussed, as well as the increase in carbon monoxide and hydrocarbon emissions during idling increased nitric oxide emission during acceleration, and increased HC emission during decelertion. Ignition timing also affects the density of HC and NO in the emission gas but not CO. The structural shape of the cylinder's combustion chamber affects HC emissions. The smaller the surface area in relation to the volume, the more advantageous for the reduction of HC emissions. Among the factors affecting surface/volume ratio are shape of the combustion chamber, compression ratio, stroke/diameter ratio, and displacement per cylinder. Even after discharge from the combustion chamber, CO and HC react with oxygen in the exhaust gas if the temperature is about 650 C or higher. The temperature of the exhaust gas is higher with sufficient oxygen and when a thinner air/fuel ratio is used with delayed ignition timing.

11179 APTIC NO. 29412

Masuda, Toyoo, Jiro Kondo, and Susumu Kotake

ESTIMATION OF QUANTITATIVE DISTRIBUTION OF AUTOMOBILE EXHAUST GAS AT AN INTERSECTION. PART 2. THE METHOD IN TERMS OF AUTOMOBILE GROUP THEORY. *(Kosaten niokeru jidosha haishutsu gasuryo bunpu no suitei. Dai 2 ho. Kurumagunronteki hoho). Text in Japanese. Preprint, Japan Society of Mechanical Engineers, Tokyo, p. 125-128, 1971. (Presented at the Japan Society of Mechanical Engineers, Annual Meeting, 48th, Chiba, Japan, April 2-6, 1971, Paper 1005.)*

If a moving pattern of automobiles in an urban area is determined by the movement of automobiles at an intersection, the quantitative distribution of the exhaust gas can be obtained by making a model of the moving pattern at an intersection. The moving pattern is obtained by modeling it in terms of the follow-up theory and also by means of a square wave traffic model which regards the flow of automobiles reached at an intersection as a group. The quantities of exhaust gas with regard to classes of automobiles at each operating condition are obtained with an engine model, utilizing experimental data on the performance of engines under normal conditions. As an example, a computed result of carbon monoxide distribution at an intersection is included.

11180 APTIC NO. 29440

Osawa, Zenjiro

THERMAL DECOMPOSITION OF POLYMERS AND ITS APPLICATION. *(Kubunshi no netsu bunkai to sono oyo). Text in Japanese. Preprint, Japan Society for High*

Polymers, Tokyo, p. 21-26, 1971. (Presented at the Symposium on High Polymer Disintegration, 2nd, Tokyo, Japan, April 14-16, 1971, Paper 7.)

The decomposition mechanism and the molecular structure of inexpensive and widely used polymers like polyethylene, polystyrene and polyvinyl chloride were reviewed. Thermal degradation of polymers was due to either the breaking of the main chain or the reaction of a side chain. Random decomposition, depolymerization, or a combination of both effected the former. The operating mechanism was estimated by the relation between the molecular weigh of the decomposition residue and the volatile product of decomposition. Monomer yields and reaction rate characteristics were analyzed for 24 kinds of polymers. Also, temperature effects were studied on the monomer yield and the decomposition product. The heat of polymerization of various polymers were closely related to the decomposition characteristics of polymers and the position of -c-c- bond breaking was estimated from the bond energy. Polymer with negative atoms or atomic groups were subject to the side chain reaction at temperatures lower than that of the main chain breaking The product of thermal decomposition of PVAc by the side chain reaction were also temperature dependent. The decomposition produc of polyvinyl chloride was also tabulated, showing that a great amount of hydrochloric acid had formed. Decomposition products of polyethylene, propylene and propane were also shown. Plastic disposal problems by thermal decomposition include the inhomogeneit of temperature in processing large amount of waste, sorting of plastics, collection and separation of decomposition products, and the effects of air.

11181 APTIC NO. 29454

Saito, Toyosaku and Mitsuru Tada

DEVICE TO DISPOSE OF COMBUSTIBLE WASTES. *(Kanensei hikibutsu shorisochi). Text in Japanese. (Assignee not given.) Japan. Pat. Sho 39-25175. 2p., Nov. 9, 1964. (Appl. April 27, 1963, claims not given).*

The incinerator described uses a fluid layer of sand on its bottom stage to ensure effective incineration of wastes. Under the bottom stage is a wind box connected to a turboblower. Above a screw feeder in the lower side wall immediately above the rostrum is a night-soil feeder device whose feeder pipe opens in the sand layer. On the opposite side is an overflow device partitioned from the main combustion chamber where the sand layer is formed. A wind box for the overflow device is connected to the turboblower by an air pipe. The fluid material feeder pipe opens in the sand layer, in which an oil burner is also installed. A smokestack extends from the top of the furnace to the cooler device, a pair of the cyclone dust collectors, a hot air fan, the water cooling tower, and finally the chimney. A screw discarger is provided on the bottom of the cooler device to discharge the ash operation of the incinerator is described. Smoke and gas are cooled and ash and other solid impurities are removed in the cooling device. The smoke and gas are further purified by the cyclone dust collectors and further cooled by the water cooling tower before final discharge through the chimney.

11182 APTIC NO. 29455

Takamatsu, Yoji

INCINERATOR. *(Jinkai shokyakuki). Text in Japanese. (Assignee no given.) Japan. Pat. Sho 38-5387. 2p., May 8, 1963. (Appl. Jan. 17 1961, claims not given).*

The incinerator described uses an inclined fire rostrum or grate made up of water pipes to produce hot water with the heat of the incineration and to cool the rostrum with water and avoid overheating from the high temperatures that may occur in such a down-draft furnace. The furnace is oblong and the inclined rostrum or grate is located in the lower part of the combustion chamber, with the ash discharge port below the rostrum. The vertical stack or chimney opens into the lower part of the combustion chamber and at about the same level with the rostrum. The lower half of the stacks is surrounded with a hollow double-pipe tube, the lower half of which is buried in the furnace. Above and outside the furnace is a water tank connected to the rostrum. The rostrum pipe closest to the stack is connected to the hollow double-pipe tube which in turn is connected to the water tank by a hot water pipe. Between two air inlet pipes on the top of the furnace is a lidded garbage feed-in port. Combustible trash and solid wastes are first thrown in and burned; the feed-in port is then closed. As combustion progresses, air enters from above and flames and smoke run downward under the rostrum, then ascend upward through and out of the stack. Water running through the rostrum pipes and the double-pipe tube is thus heated. As more garbage is thrown, to make a red hot carbon layer is formed which can rapidly evaporate the water content of water kitchen garbage. When contacted with the red hot carbon layer, the steam produced by the evaporation and mixed with the air becomes semi-watered gas which raises the furnace temperature to about 800 C, high enough to melt glass and deodorize fuel odors.

CONTROL METHODS

11183 APTIC NO. 27277

Lurgi Gesellschaft fuer Waerme-und Chemotechnik m.b.H. (West Germany)

POWER PLANT INTEGRATED WITH PRESSURE GASIFICATION OF COAL. *Combustion, 42(8):12-13, Feb. 1971.*

The Lurgi process for the pressure gasification of coal has long been used in the manufacture of town and synthesis gas. It is now being applied to the production of fuel gas for a gas turbine power plant. At a prototype plant, coal is gasified with air and steam and ghe generated fuel gas is thoroughly washed in a scrubber so that it enters a combustion chamber free of dust and alkalies. Hydrogen sulfide can also be easily removed from the pressurized gas by scrubbing and converted to sulfuric acid or elemental sulfur. Because the fuel gas produced by pressure gasification is lean, very little excess air is needed for combustion. The sensible heat of combustion is first utilized to generate superheated high pressure steam. The gases emerging from the pressurized steam generator then drive a ga turbine having a net capacity of 74 MW.

11184 APTIC NO. 27279

Jones, Allen H.

THE BASICS OF DUST COLLECTION. *Plant Eng., 25(4):71-73, Feb. 18, 1971.*

Dry mechanical collectors, wet dust collectors, electrostatic precipitators, and cloth bag dust collectors are described. The settling chamber reduces air stream speed to a velocity so low that dust particles drop of their own weight into a collection hopper. Skimmers force the air stream to change direction. Cyclones depend on centrifugal force for separation of dust particles, and the multicyclones consist of a number of small diameter cyclones. Mechanical collectors generally operate with fairly low pressure drops in order to produce the required efficiencies. Wet dust collectors include spray towers, wet cyclones and wet fans, the impingement collector, packed towers, impingement baffle scrubbers, and venturi collectors. In general, the greater the difference in relative velocities between dust particles and water droplets, and the finer the droplets, the greater the wet collector's efficiency. Electrostatic precipitators use electrodes to ionize incoming dust particles, which are then attracted to positively charged collector plates. Tube filters and flat envelope filters are described as types of cloth collectors. Costs and some other factors are indicated in choice of dust collection equipment.

11185 APTIC NO. 27282

Ellison, William

WET SCRUBBERS POPULAR FOR AIR CLEANING.

Power, 115(2):62-63, Feb. 1971.

While collection of gas-borne particles is the primary function of wet scrubbers, they also embody a number of additional process steps such as gas conditioning, liquid separation, and mist elimination. The principal mechanism involved in wet collection of particulate matter is impingement of individual particles upon scrubbing liquid droplets. Advantages of wet scrubbers include the following: compact equipment, a generally smaller capital expenditure than for fabric filters or electrostatic precipitators, ability to collect particles from 0.2 to over 10 micron, selection of collection efficiency by varying input, elimination of dust disposal, no limitation on temperature or humidity, and low maintenance costs. Requirements for minimizing emissions of sulfur dioxide, hydrogen chloride, and fluoride are mentioned. Operating costs, capital cost, dust collection efficiency, and gas pressure drop are compared for various types of wet scrubbers.

11186 APTIC NO. 27284

Graves, I. L.

AIR-BORNE PARTICLES IN A LAMINAR AIR FLOW RECOVERY ROOM FOR KIDNEY AND HEART TRANSPLANT PATIENTS.

Am. Ind. Hyg. Assoc. J., 32(1):47-51, Jan. 1971. 11 refs.

Air filtration in a laminar air flow hospital room reduced the quantity of electrostatically precipitated dust to 20.8% of that in pre-filtered air and to 24.7% of the amount present in a normal room. The average rate of vertical air flow from the 26 high-efficiency particulate air filters was set at 55 ft/min; the amount of new outside air required per minute to maintain a positive pressure of 0.11 inches of water in the LAFR was approximately 10% of the volume of the room (20,800 cu ft). Electrostatically precipitated dust from the LAFR was examined in the electron microscope, analytical centrifuge, and counted in a Coulter counter. A Norelco x-ray diffraction instrument was used for the analyses of crystalline compounds, while the metals in the dust were determined using emission spectroscopy. Eight metals were found in the LAFR dust whereas pre-filtered and normal room dust had 10 and 13 respectively. Sodium chloride was the only crystalline compound identified in the LAFR air whereas silicon dioxide and gypsum were in all other samples analyzed. No viruses or microorganisms were isolated from the LAFR dust. Size of the particles collected is mentioned, as well as the effect of agglomeration. If the LAFR environment is not substantially altered by personnel, it may be helpful to patients being treated with immunosuppressant drugs and to those sensitive to airborne allergens. (Author abstract modified)

11187 APTIC NO. 27288

Shigeta, Yoshihiro

TECHNIQUE CONCERNING THE PROCESS TO REMOVE OFFENSIVE SMELL BY COMBUSTION.

(Nensho hoshiki ni yoru akushu jokyo gijutsu). Text in Japanese. PPM (Japan), 2(1):54-59, Jan. 1971. 7 refs.

Difficulties in odor countermeasures are caused by the following factors: first, impulse measurement of the sense of smell varies logarithmically with the concentration of the substance of the offensive odor. Thus, slight increase in the offensive substance is not easily sensed. The second factor is based upon the law of Weber-Fechner. A 50% removal rate of the offensive odor is scarcely perceived by the sense of smell while when a removal rate of between 99.9% and 99.99% is obtained, the decrease in offensive odor is admitted by the neighboring citizens. Third, sense of smell fatigue may become an obstacle when the concentration of offensive odor is measured or a test of the sense of smell is conducted. Fourth, the offensive odor that causes complaints of the neighboring citizens comprises multiple contents of which each has its own threshold value. Fifth, there is a great difference in each individual's sensory organ. Sixth, the evaluation of offensive odor pollution varies with areas. In connection with a combustion deodorization process, at first an odor has to go through the minimum condition of heating to 650 C for more than 3 seconds. It is not permisslble for an offensive odor to go through imperfect combustion in stoking equipment. Setting two sheets of steel in stoking equipment helps to avoid such a possibility. In case oversaturated moisture and offensive odors are mixed with each other at such a high temperature in a digester used in a kraft pulp factory or in a dryer, glossal stoking equipment and an energy source are necessary to remove the offensive odor by burning. Therefore, moisture in the offensive odor has to be removed in advance before the combustion deodorization process is operated. The following process is most often adopted as effective for removing moisture: dust mixed with the offensive odor is at first removed by a cyclone. Then vapor in the offensive odor is removed because the temperature of the offensive smell is reduced until it is about 15 degrees higher than that of air. The residual vapor is eliminated by an ejecter while the residual moisture is again eliminated by an after condenser.

11188 APTIC NO. 27290

Wisely, F. E., G. Wayne Sutterfield, and David L. Klumb

ST. LOUIS POWER PLANT TO BURN CITY REFUSE.

Civil Eng., (N. Y.), 41(1):56-59, Jan. 1971.

A process for disposing of domestic solid waste is described, by which refuse is utilized as supplementary fuel for large power plant boilers. Not only is the process less expensive than conventional incineration, but large efficient furnaces are already in existence for application of the process. Refuse is low in sulfur, and its use as fuel could reduce sulfur oxide emissions as well as eliminate the particulates from the chimneys of conventional incinerators. Fossil fuel consumption could be reduced and magnetic metals could be recovered. Boilers designed to burn pulverized coal are far more efficient, operating at higher furnace temperatures and with relatively low percentages of excess air, than conventional incinerators burning only municipal refuse. As presently contemplated, preparation of the refuse includes only particle size reduction and the removal of magnetic metal. Potential effects of burning the refuse upon boiler operation are considered, as well as the utilization of commercially available equipment. Design criteria for full scale test are mentioned, including capital and operating costs.

11189 APTIC NO. 27295

Bartok, W., A. R. Crawford, and A. Skopp

NITROGEN OXIDE POLLUTION: CONTROL OF NOX EMISSIONS FROM STATIONARY SOURCES. *Chem. Eng. Progr., 67(2):64-72, Feb. 1971. 35 refs.*

Potential combustion control techniques for reducing nitrogen oxides emissions from stationary sources consist of modifying equipment and design features which affect such combustion parameters as excess air level, heat release and removal rates, and distribution of fuel and air. The evaluation of a kinetic model of nitrogen oxide formation has shown that the most important operating modifications are low excess air-firing, two- stage combustion, flue gas recirculation, water injection, and combinations of these techniques. The important design features are burner configuration, locating and spacing, and the types of firing and combustion methods used. Removal of nitrogen oxides from flue gases provides a potential alternate method for controlling combustion-related emissions. Flue gas treatment processes potentially capable of controlling sulfur oxides emissions as well as nitrogen oxides are catalytic combustion; catalytic reduction; adsorption/reaction by solids; absorption/ reaction by liquids; and physical separation. The estimated degree of nitrogen oxides reduction and associated costs resulting from the application of potential control techniques are presented for a 1000 MW gas-fired and 1000 MW coal-fired power plant boiler.

11190 APTIC NO. 27302

Herod, Buren C.

LIME PLANT OPERATORS HOLD ANNUAL SESSION. *Pit Quarry, 63(8): 79-83, Feb. 1971.*

At the 1970 annual meeting of the National Lime Association, major emphasis was placed on the performance of various dust control systems and methods of disposing of collected dust or sludge. Dust control is a particularly difficult problem for the lime industry, since lime plants have more points requiring control than even a utility. Among control equipment currently in use are electrostatic precipitators, cyclones, bag houses, and wet scrubbers. These are used alone or in combination. At one installation, dust from a rotary kiln is collected in a bag house and sold for use in base materials or asphalt mixes. At the same installation, some of the dry dust from a shaft kiln is caught by cyclones and the remainder in a scrubber, from which it flows to a settling tank as sludge. The dry dust and the sludge are mixed and then conveyed to a disposal site. The forthcoming emission standard for lime plants is expected to be 65 micrograms/ cu m of air.

11191 APTIC NO. 27323

Yoshida, Koichi

PUBLIC NUISANCE OF MOTOR VEHICLES. *(Kogai mondai). Text in Japanese. Jidosha Gijutsu (Automobile Eng.), 24(6): 684-687, June 1970. 82 refs.*

The present status of air pollution created by automobiles is reviewed. Especially emphasized are the control measures for exhaust gases and research concerning them. For gasoline engines, the Japan Automobile Research Institute has been conducting research on the following topics: the condition of fuel supply during the crossover period, improvement of engine combustion, pollution control valves, and basic problems such as measurement methods, distribution of induced air, variation in combustion and non-uniform combustion, and components of exhaust gas during the transition period. Further topics discussed include exhausts from diesel engines, noise, and statics which fall into the category of public nuisance rather than air pollution.

11192 APTIC NO. 27325

Pelleu, G. B., Jr. and L. W. Wachtel

ELECTROSTATIC PRECIPITATION VS. HEPA FILTRATION IN REDUCTION OF AIRBORNE MICROORGANISMS IN DENTAL OPERATING ROOMS. *National Naval Medical Center, Bethesda, Md., Naval Dental School., Work Unit MR.005.20-6051, NDS-TR-014, 5p., May 1, 1970. 7 refs.*

NTIS, DDC: AD 710372

The effectiveness of electrostatic precipitators and high efficiency particulate air filters in reducing microbial air concentrations was compared in two dental operating rooms. Samples were taken for two consecutive hours each morning during which routine dental procedures were performed, and the concentration of viable particles was determined with a Reyniers slit sampler at an air flow rate of 1 cfm. The concentration in the air of empty DOR's, which was usually 5.0 VP/cu ft, was reduced to 1.0 to 2.0 VP/cu ft by either the electrostatic precipitators or the high efficiency particulate air filters. Peak microbial concentrations of approximately 80 VP/cu ft obtained during some dental procedures were reduced by either electrostatic precipitators or high efficiency particulate air filters faster than with no cleaners. A factor in the selection of an air cleaning device is the ratio of room size to unit flow rate; this ratio should be no greater than 2 to 1. (Author summary modified)

11193 APTIC NO. 27340

Lambert, Frank L. and Forrest C. Alley

A SIMPLIFIED METHOD FOR OBTAINING DYNAMIC PARAMETERS FOR A FIXED-BED ADSORPTION PROCESS. *Preprint, Air Pollution Control Assoc., Pittsburgh, Pa., 30p., 1970. 10 refs. (Presented at the Air Pollution Control Association, Annual Meeting, 63rd, St. Louis, Mo., June 14-18, 1970, Paper 70-69.)*

In order to predict the performance of a particular solute- adsorbent system, the knowledge of certain equilibrium and kinetic functions is required. Methods of evaluating the parameters of adsorption systems are reviewed. The problem is to account for both equilibrium and nonequilibrium effects in an experimental analysis such that the experimental system closely approximates the real system. A dynamic approach is described which utilizes a Laplace transformation to obtain the moments of the chromatographic distribution function. From these moments, the statistical quantities are evaluated, thus providing information about peak characteristics which are then related to the dynamic parameters of the system. A distinct advantage of the pulse method is that the apparatus used in the analysis is a gas chromatograph which employs a column packed with the desired absorbent. The equilibrium constant, mass transfer and dispersion coefficients were calculated for ethylene and ethane using an activated carbon adsorbent. A digital computer was used to simulate the adsorption column and validate the various parameters measured.

11194 APTIC NO. 27365

Cockrell, Charles F., Richard B. Muter, Joseph W. Leonard, and Ronald E. Anderson

STUDY OF THE POTENTIAL FOR RECOVERING UNREACTED LIME FROM LIMESTONE MODIFIED FLYASH BY AGGLOMERATE FLOTATION. FINAL REPORT. *West Virginia Univ., Morgantown, Coal Research Bureau, NAPCA Contract PH 22-68-18, 261p., May 1970. 8 refs.*

NTIS: PB 196779

As part of the evaluation of limestone injection for sulfur oxide control, the possibility of by-product recovery from the large quantities of limestone modified flyash generated in the process was investigated. As a result of initial promising data obtained on froth flotation of 200 times 325 mesh fractions of the modified flyash, the feasibility of recovering the unreacted lime by flotation separation was determined. Grades of lime recovered were as high as 80% in comparison to the 47.6% grade obtained in the preliminary froth flotation tests. However, as lime grade increased, the recovery of lime decreased. This was attributed to the embedding of small siliceous particles in the lime constituents and the coating of the siliceous coal ash fraction with soluble lime. Employment of carbonation for pH and soluble lime control, modifiers for zeta potential control, agglomerate (emulsion) flotation, and recleaning of the lime concentrates, evaluated by thermogravimetric analysis and microscopic studies, did not improve the yield and grade of lime to permit recovery of a majority of the lime in a highly concentrated form. It was indicated that lime grade and yield might be improved through further study; however, the results obtained and the increased interest in wet collection of limestone modified flyash do not warrant further work in this area at this time. Studies will continue on another approach which still appears feasible: mineral wool production in conjunction with sulfur recovery. (Author summary modified)

11195 APTIC NO. 27367

Muzio, Lawrence Joseph

THEORETICAL AND EXPERIMENTAL INVESTIGATION OF TEMPERATURE AND COMPOSITION DURING COMBUSTION IN A CLOSED SYSTEM. *California Univ. Berkeley, Coll. of Engineering, Thesis (Ph.D.), 170p., July 1970. 65 refs. Grant AP 00385, Rept. TS-70-7.*

An analytical model of the combustion process in a closed system is developed, which utilizes real gas properties and assumes the burned gas region to be non-uniform. Numerical calculations using this model predict a 600 K temperature difference across the combustion chamber with the high temperature region adjacent to the point of ignition. Chemical kinetic calculations show that the formation of nitric oxide is greatly influenced by the temperature gradient. Experimentally, an infrared polychromator and a single cylinder CFR engine equipped with quartz windows in the combustion chamber and run on a premixed propane/air mixture were used to determine the temperature and temperature gradient in the combustio products during the expansion process. Selected spectral regions of 1.8 and 2.7 micron water vapor bands were monitored simultaneously during a single engine cycle and the temperatures determined using the emission-absorption technique. The spectroscopic temperatures were within 100 K of the ideal bulk gas temperature which was inferred from the combustion chamber pressure and volume. A multiple wavelength, single line of sight technique was employed to measure the temperature gradient along the path of flame travel. This technique was chosen in order to obtain all necessary experimental data during a single engine cycle and avoid averaging due to cycle to cycle variations. Results of a two wavelength two zone formulation yielded a temperature difference on the order of 750 K across the combustion chamber, which considering the probable experimental uncertainty, is shown to be in agreement with the analytical predictions. (Author abstract)

11196 APTIC NO. 27368

Barton, R. K.

CORRELATION BETWEEN CYCLE-BY-CYCLE CYLINDER GAS MOTION AND COMBUSTION VARIATIONS OF AN SI ENGINE. *Pennsylvania State Univ., University Park, Dept. of Mechanical Engineering, NAPCA Grant 00560, Rept. S45, 122p., Aug. 1970. 35 refs.*

The possible correlation of cycle-by-cycle (CBC) combustion process variations with CBC variations of the gas motion in the vicinity of the spark plug at the time of ignition, resulting in CBC cylinder pressure development variations, was investigated. The extent of CBC combustion variations of a single cylinder spark ignition engine were determined for specific characteristics of the cylinder pressure development histories. The extent of CBC gas velocity variations were determined in the vicinity of the spark plug of the motored engine using a hot film sensor. The sample standard deviations of the cylinder velocity in the vicinity of the spark plug and the crank angle at which maximum cylinder pressure occurred were correlated for different engine operating variables. The correlation was made using a model which assumed the time required to burn approximately the first 5% of the fuel was dependent only on this velocity. The results led to the conclusion that CBC combustion variations are caused by CBC variations of the gas velocity in the vicinity of the spark plug at the time of ignition. Additionally, a quantititative measure of the phasing of the combustion process allows the effects of thes velocity variations on maximum cylinder pressure to be evaluated for different engine variables. Three areas in which controlling the cause of CBC combustion variations could reduce vehicle exhaust emissions and improve engine performance are engine surge, knocking combustion, and CBC exhaust variations. (Author abstract modified)

11197 APTIC NO. 27369

Coutant, R. W., R. E. Barrett, R. Simon, B. E. Campbell, and E. H. Lougher

INVESTIGATION OF THE REACTIVITY OF LIMESTONE AND DOLOMITE FOR CAPTURING SO2 FROM FLUE GAS. *Battelle Memorial Inst., Columbus, Ohio, Columbus Labs., NAPCA Contract Ph 86-67-115, 68p., Nov. 20, 1970. 18 refs.*

NTIS: PB 196749

The kinetics of the reaction of limestone with sulfur dioxide under conditions that simulate those expected in normal powerplant operation were investigated with application to the dry-limestone injection process for control of sulfur oxide emissions. In particlular, the course of reaction was studied with respect to calcination of stone, sulfite formation, and sulfate formation under nonisothermal conditions at short residence times (0.1 to several seconds) with injection temperatures ranging from 1600 to about 2450 F. A new, improved, dispersed-phase reaction permitted study of the SO2-limestone reaction over a wide range of temperatur and residence time than was previously possible. The results with limestone No. 2061 (mostly -140 plus 200 U. S. standard mesh) suggest injection temperature in a boiler should not be higher than 2000 to 2200 F. The initial rate of reaction is dependent on the square root of the SO2 concentration, but as the sulfate loading increases, the rate becomes more dependent on SO2 concentration. This would indicated that the process may function relatively efficiently where SO2 levels are initially high, but with medium to low-sulfur fuels, the relative efficiency of the process probably will be low. It may be possible to improve the efficiency of the process by use of higher excess-air levels in the boiler, although it is recognized that this will decrease boiler efficiency The use of precalcined stone in the boiler is not recommended. (Author conclusions modified)

11198 APTIC NO. 27371

Moran, John B. and Otto J. Manary

EFFECTS OF FUEL ADDITIVES ON THE CHEMICAL AND PHYSICAL CHARACTERISTICS OF PARTICULATE EMISSIONS IN AUTOMOTIVE EXHAUST. INTERIM REPORT. *Dow Chemical Co., Midland, Mich., Organic Chemical Dept., Contract CPA-22-69-145, 169p., July 1970. 2 refs.*

NTIS: PB 196783

A research program is reported that is intended to develop methods of generating, collecting, and analyzing particulates in automotive engine exhaust by a means sufficiently accurate and reproducible to allow determination of the effects of fuel additives on exhaust particulate size, concentration, and composition. It was determine that it is essential to condition the clean (new) engine with the test fuel for a period of at least 75 hours under cycled conditions before stable gaseous and particulate emissions are achieved. An air dilution chamber was designed which allows for cooling, dilution, and mixing so that representative particulate samples can be obtained at a sampling station which is essentially equivalent to 8-10 feet downstream of the end of the exhaust pipe on a vehicle at highway speeds. Temperature of the diluted exhaust at the sampling station is around 110 F. The work reported was conducted using a 1970 Chevrolet 350 CID engine of 9.0:1 compression ratio with a standard exhaust system attached, loaded by means of an engine dynamometer. Sampling was conducted with the engine operating at 2250 RPM and 17.0' Hg manifold vacuum from 4 of the 8 cylinders. A few sampling runs were conducted under mild cycled conditions consisting of several cruise modes. Special analysis techniques were developed for the analysis and characterization of exhaust particulates. The details of these techniques are included From studies with an anti-knock compound (tetraethyl lead), lead scavengers, and a detergent additive (DMA-4A) showed that increased concentration of TEL from trace levels to intermediate levels (1.5 ml/gal) produces an unusual increase in hydrocarbon emissions buildup and in combustion chamber deposits but a small increase in particulate emissions. Additives which effectively remove reaction products from the combustion chamber also reduce hydrocarbon emissions of the stable, conditioned engine but, as a result, increase particulate emission levels. It appears that, in effect, the presence or absence of TEL and scavengers does not substantially change the total amount of organic material present in all collected particles, but the percentage organic is much higher for low TEL fuel runs because the mass of particles emitted is much lower, probably because the essentially same base fuel is used for all runs.

11199 APTIC NO. 27377

Levy, Elaine A.

THE BIOSPHERE AS A POSSIBLE SINK FOR CARBON MONOXIDE EMITTED TO THE ATMOSPHERE. FINAL REPORT. *Stanford Research Inst., Irvine, Calif. Contracts CAPA-4-68(2-68) and CPA 22-69-43, SRI Project PSU-7888, 31p., May 1970. 12 refs.*

NTIS: PB 195433

The capacity of various elements of the biosphere to remove carbon monoxide from the atmosphere was investigated by exposing test samples to 100 ppm CO in environmental chambers under static experimental conditions. Analysis was by gas chromatography. Results showed that nonsterile soil depleted CO rapidly from test atmospheres containing initial concentrations of 100 ppm CO. This effect was enhanced by increasing temperatures and eliminated by steam sterilization, indicating that heat-labile biological mechanisms were involved. The minimal experimental depletion rates demonstrated theoretically could account for 2.06 times 10 to the 15th power grams CO annually on a worldwide basis. Moistened vermiculite exposed to ambient air for several weeks depleted CO from test atmospheres containing 100 ppm CO. Sterlization eliminated this effect. CO decreased in the atmosphere above plant of pepper, geranium, and barley growing in nonsterile support medium (soil, vermiculite). However, the role of higher plants as a possible CO sink could not be adequately assessed because the plant effects, if any, were masked by those of the support media. The effect of marine plants on CO disappearance indicated a trend toward marine plant utilization of CO at temperature of 19.5 C but not at 10 C. Thus, the findings suggest that the microorganisms in the biosphere can serve as a CO sink, although further study is necessary. (Author summary modified)

11200 APTIC NO. 27385

Kovach, J. L. and R. G. Newton

DEEP BED ACTIVATED CARBON FOR LIQUID, SOLID, AEROSOL AND GASEOUS FILTERS. *Harvard Univ., Boston, Mass., Harvard Air Cleaning Lab. and Atomic Energy Commission Washington, D. C., Div of Reactor Development and Technology, Proc. At. Energy Comm. Air Cleaning Conf., 11th, Richland, Wash., 1970, p. 737-750. 4 refs. (Aug. 31-Sept. 3.)*

NTIS CONF 700816, Vol 2

A 15-in. deep carbon bed consisting of coarse particle size carbon followed by HEPA filters was designed for the filtration of radioactive particulates and gaseous waste. A feasibility study of the system showed that the bed exhibits a satisfactory protective action, prefiltering even submicron aerosols and preventing overloading of the HEPA filters. This property was indicated by both the removal efficiency of the carbon bed and the slight pressure drop increases through the filters even at very high dust loadings. The design of the bed permits easy continuous monitoring of decontamination efficiency and the in situ regeneration of a weathered carbon bed by the introduction of hot inert gas.

11201 APTIC NO. 27392

Chatterjee, Anil K.

A STUDY OF GASEOUS CONTAMINATION FROM A TORRAX SLAGGING TYPE HIGH TEMPERATURE SOLID WASTE DISPOSAL SYSTEM. *Preprint, Air Pollution Control Assoc., Pittsburgh, Pa., 16p., 1970. 9 refs. (Presented at the Air Pollution Control Association, Annual Meeting 63rd, St. Louis, Mo., June 14-18, 1970, Paper 70-54.)*

Torrax Solid Waste Disposal embodies a complete disposal system that will accept both combustible and noncombustible refuse in the as-received condition and dispose of it without any associated environmental pollution. Filtered combustion air is pre-heated to any desired temperature up to 2000 F in the Super Blast Heater. A limited amount of combustion occurs in the Gasifier to release a certain amount of sensible heat that functions to pyrolyze organic matter and to convert the non-combustibles to molten slag. Complete combustion of the evolved products takes place in the Igniter, while the remaining equipment serves to extract heat from the gaseous effluent of the Igniter and to cleanse the gas stream of particulate matter. Steam plume supression is indicated, as well as the control of sulfur dioxide emissions, carbon monoxide, oxides of nitrogen, and hydrogen chloride.

11202 APTIC NO. 27456

NEW YORK CITY IS TESTING LOW-POLLUTION VEHICLES FOR LONG-TERM URBAN SERVICE. *Automotive Eng., 79(3):48-50, March 1971.*

A turbine powered car, vehicles burning alternate fuels, and vehicles with converters are all part of a program in New York City to develop low pollution vehicles for city car and truck fleets, as well as for taxicabs. An 80-hp regenerative gas turbine engine, developed by Williams Research Corp., will be installed in an American Motors 4-door Hornet. While the engine already emits low levels of unburned hydrocarbons and carbon monoxide, it has not yet minimized emissions of oxides of nitrogen. Design characteristics of the engine are indicated, and it will operate on a variety of fuels, including unleaded gasoline and diesel fuel. Two basic systems are proposed for the low pollution taxicab venture: electronic fuel injection, combined with exhaust gas recirculation and catalytic converters; electronic fuel injection or rich-mixture carburetion, combined with exhaust gas recirculation and exhaust manifold thermal reactors. Alternative fuels will include compressed natural gas and liquefied petroleum gas.

11203 APTIC NO. 27462

Adlhart, O. J., S. G. Hindin, and R. E. Kenson

NITROGEN OXIDE POLLUTION: PROCESSING NITRIC ACID TAIL GAS. *Chem. Eng. Progr., 67(2):73-78, Feb. 1971. 4 refs.*

Most nitric acid plants use catalytic combustion units for decolorizing nitrogen oxides in tail gas and for recovering heat. In this application, platinum metals on spherical or unitary (honeycomb) supports have been successful. The spherical catalyst has a longer life, but the honeycomb catalyst permits a smaller and less expensive catalyst vessel. A honeycomb catalyst can also be used in various bed configurations, and horizontal or vertical mounting can be employed to fit plant space requirements. Although the same fuels are used to ignite the catalysts, catalyst requirements for nitrogen oxides abatement are much more stringent than for decolorization. Careful consideration must be given to catalyst stability, reactor inlet and outlet temperature, and tail gas composition. When oxygen concentrations are higher than 2-2.5%, platinum honeycomb catalysts require a two-stage reactor, with or without a bypass.

11204 APTIC NO. 27470

FLUIDIZED BEDS--PART I: FLUIDIZED REACTORS BECOMING POPULAR. *Can. Chem. Process., 55(2):20, 21, 24, Feb. 1971.*

Canada's pulp and paper and metallurgical industries are increasingly turning to fluidized-bed reactor systems since these offer thermal efficiency and uniformity of reactor environment. Basically, a fluidized bed functions when a bed of solid particles is set in fluid motion by directing a stream of gas, under carefully controlled conditions, up through the bed. The gas stream forces a passage between the particles, setting them in homogeneous motion and causing the solids to take on a fluid character. Advantages resulting from this fluidized state are temperature control, continuity of operation, hea transfer, and catalysis. A new application of the fluidized-bed reactor is the reduction of zinc concentrates to calcine. One plant has solved the problem of removing the calcine dust from sulfur dioxide-containing roaster gases by a combination cyclone-electrostatic precipitator system. The roaster plant is provided with control instrumentation for sulfur dioxide analysis and precipitator electrical data. An important feature of the fluidized bed reactor in iron ore reduction is the reduced gas throughput and resulting higher SO2 concentrations in the gas which permit more efficient acid production. The heat of reaction in this type of reactor is commonly scavenged to provide process steam.

11205 APTIC NO. 27474

Kooyama, Hiromichi, Tsuguo Ogawa, and Mitsuharu Nakahara

INLET MANIFOLD WATER INJECTION FOR CONTROL OF NITROGEN OXIDES OF 2-STROKE GASOLINE ENGINE. *(2 Saikuru gasorin engin no mizu funsha ni yoru NO taisaku). Text in Japanese. Jidosha Gijutsukai Ronbunshu (Proc. Soc. Automotive Engrs.), no. 1:22-27, Nov. 1970. 5 refs.*

Parallel theoretical and experimental studies were conducted to determine the influence of inlet manifold water injection on nitric oxide emission from a 2-stroke gasoline engine. Theoretical predictions that water injection would reduce combustion temperature with a corresponding drop in NO were confirmed by nondiffusion ultraviolet analysis of NO emissions. The extent to which NO is reduced depends on the air-gasoline ratio and contamination of the water. The 4-mode cycle test showed that the water injection can appreciably reduce NO without adversely affecting the operating performance of a vehicle.

11206 APTIC NO. 27476

Hasegawa, Yoshikazu, Mitsuo Fukushima, Michio Koizumi, Tatuo Ono, and Hisao Mizuochi

ON THE ULTRASONIC UPGRADING OF FUEL OIL. *(Chonpa ni yoru nenryoyu kaisen koka no kento). Text in Japanese. Electric Power Industry, Tokyo (Japan)Technical Lab. Rept. 70019, 27p., July 1970. 19 refs.*

Khafji crude oil was irradiated by 20 KHz ultrasonic radiation at 20-410 C and a hydrogen pressure of 40 Kg/sq cm G. The experiments were conducted in both batch and flow system autoclaves and with a cobalt-molybdenum-aluminum catalyst. Cavitation caused by ultrasonic irradiation was observed at high temperatures. Viscosity and density were also decreased by processing at about 400 C. Low temperatures produced no change in viscosity and density or in the asphaltene content of the oil. The application of ultrasonic irradiation to hydrodesulfurization increased the sulfur removal rate of 1.5 times.

11207 APTIC NO. 27484

SO2 RECOVERY BY WELLMAN-LORD. *Wellman-Lord, Inc., Lakeland, Florida, 37p., 1970 (?).*

The Wellman-Lord sulfur dioxide recovery process is a wet regenerative system which recovers at least 90% of the SO2 from stack gases, in excess of 97% of any sulfur trioxide and acid mists, and about 90% of the fly ash. It can be adapted to small industrial units, smelters, Claus sulfur producing plants, coal and oil fired power generating plants and sulfuric acid plants. Development of the process, pilot and prototype experience, commercial application, and capital and operating costs are indicated. In the present system, sodium sulfite is used to scrub the SO2 containing flue gases, reacting to form the corresponding bisulfite and pyrosulfite. The solution is regenerated by releasing the SO2 through application of heat. Solids formed in this process step are redissolved and the solution recycled to the absorber.

11208 **APTIC NO. 27485**

Hobson, H. L., R. A. Mill, and C. H. Lawrence

REMOVAL OF SULFUR DIOXIDE FROM AN AIR STREAM WITH WASTE STABILIZATION PONDS. *J. Environ. Health, 33(4):366-370, Jan.-Feb. 1971. 15 refs.*

An investigation was conducted to evaluate combination pollution control by operating a laboratory waste stabilization pond, aerating it with air containing a known concentration of sulfur dioxide, and evaluating the results to determine the feasibility of the process and to direct the course of further in-depth experimentation. Although pollution control has been characterized as either liquid, gaseous, or solid, a more economical approach would seem to be one unit that processes at least two and hopefully all three forms of pollution. At least two factors make the waste stabilization pond suitable for combination with sulfur dioxide scrubbing: first, it has been reported that highly alkaline conditions, pH values up to 11.5, are common in such ponds; secondly, by using ponds equipped with subsurface aerators, the introduction of a gas stream could be easily accomplished thus eliminating large scale modification of the pond system. Waste stabilization pond operation and efficiency were determined by analyzing for the biochemical oxygen demand and total Kjeldahl nitrogen on the pond influent and effluent. Sulfates were determined turbidimetrically, while sulfur dioxide was measured with a Kitagawa gas sampler and by the West and Gaeke Method. Design and construction of the 10-gal glass aquarium fed with untreated domestic sewage are described. SO2 at a concentration of 25 ppm was removed from the air stream by the WSP with efficiencies greater than 99%. With a loading rate of approximately 30 pounds per acre per day and a detention time of 15 days, liquid waste treatment was not significantly affected by SO2 in the aeration gases. This was demonstrated by only a 5% decrease in BOD removal and an increase of 3% in total nitrogen removal. SO2 was not leaving the pond in the gaseous effluent and only an 11% increase in sulfates was detected in the liquid effluent. The white layer which developed on the sludge blanket leads to the conclusion that the SO2 was being precipitated in a chemical form or was being incorporated into microorganisms that inhibit the anaerobic zone. More parameters which need to be investigated are mentioned.

11209 **APTIC NO. 27487**

Ishikawa, Toshio, Kazuo Shimada, Takashi Hayakawa, Katsumi Takehira, Satoshi Oshima, Yasunori Kuriki, and Yoshihide Kotera

DESULFURIZATION OF HEAVY OIL BY HYDROGENATION WITH MOLYBDENUM- NICKEL-ALUMINA CATALYST. *(Moribuden-nikkeru-arumina kei shokubai niyoru juyu no suisoka datsuryu). Text in Japanese. Kogyo Kagaku Zasshi (J. Chem. Soc. Japan), 74(2):196-199, Feb. 1971. 1 ref.*

A molybdenum-nickel-alumina catalyst was used to desulfurize heavy oil. Both the nickel and molybdenum alone were effective catalysts but they were more effective when used together. A desulfurization rate of 63.4% of a viscosity of 4 and a reaction temperature of 400 C. The apparent activation energy was calculated to be 17 kcal/gram atom-S. Oxides of molybdenum and nickel formed an amorphous structure with gamma-alumina, which became a sulfide in the course of desulfurization. Crystalline MoO3 or NiMoO4 did not seem to posses the activity, which is considered to be closely related to cracking.

11210 **APTIC NO. 27488**

Renault, Ph., A. Deschamps, C. Dezael, J. C. Simandoux, and Y. Barthel

I.F.P. SULFUR RECOVERY PROCESS. *Preprint, Japan Petroleum Inst., Tokyo, 16p., Feb. 1971. (Presented at the Japan Petroleum Institute Meeting on Desulfurization and Reclamation of Waste Gas, Tokyo, Feb. 25-26, 1971.)*

Since conventional Claus units do not achieve the complete conversion of hydrogen sulfide to sulfur, the atmosphere is polluted by sulfur dioxide formed during incineration of unconverted sulfur compounds and dispersed in the smoke from these units. This pollution is markedly reduced by treating Claus tail gas with a liquid catalyst made up of a catalyst dissolved in an organic solvent. The process, which furnishes liquid sulfur of the same quality as Claus sulfur, is based on the following balanced exothermic reaction: 2SH2 plus SO2 in equilibrium with 3S plus 2H2O. Data are presented on the principle physical properties of the selected solvent and on the results of two and three-stage catalytic treatment of Claus tail gas. Additional treatment is suggested to reduce acidic gases to less than 500 ppm and to remove other sulfur compounds such as carbonyl sulfide and carbon disulfide. This finishing treatment involves the conversion of all sulfur compounds to SO2, ammonia scrubbing of the SO2, and conversion of ammonium sulfite to liquid sulfur. These processes are also applicable to the treatment of ammonium sulfide-containing waste waters originating from hydrotreating units and ammonium sulfite brines originating during the purification of flue gases.

11211 **APTIC NO. 27500**

First, M. W., A. S. Goldin, O. Grubner, P. C. Reist, D. W. Underhill, F. J. Viles, Jr., H. Yusa, T. Baldwin, and D. W. Moeller

SEMIANNUAL PROGRESS REPORT HARVARD AIR CLEANING LABORATORY SEPTEMBER 1, 1969 - FEBRUARY 28, 1970. *Harvard School of Public Health, Boston, Mass., Air Cleaning Lab., AEC Contract AT(30-1)841, 45p., April, 1970. 9 refs.*

NTIS: NYO-841-22

Removal of sodium aerosols by industrial bag filters, physical and chemical properties of sodium aerosols, behavior of iodine in sodium and sodium compounds, and the design of a noble gas adsorption system are studied; plans for the 11th AEC Air Cleaning Conference are presented. Evaluation of performance characteristic of industrial cleanable fabric filters for removal of sodium aerosols show that Teflon has a lower temperature tolerance (450 F versus 600 F) than glass, is less fragile, has greater chemical resistance to sodium and its oxides, and releases deposited filter cake more easily. Chamber gas volume withdrawal of 1%/min through the filtration system does not hasten the clearing of chamber particles from the air, indicating a need for local exhaust ventilation. The filtration part of the cycle lengthens when sodium loadings are highest, a phenomenon important to the design of accident control systems. Study of physical and chemical properties of sodium aerosols confirms that, for a given containmen shape and volume, aerosol concentration shortly after a sodium burn has ceased is independent of the amount of sodium burned or the peak concentration during the burn. Immediately after deposition, sodium could be removed with a brush attachment on a vacuum hose; a day later, it could not because the deposited material had converte to hydroxide form. Behavior of iodine in sodium and sodium compounds is important in evaluating potential hazards in a fast breeder reactor system. Two experiments using iodine-131 tracer were designed. At 630 C, there was a small (0.03% 0.06%) evolution of volatile iodine from NaI Na202; at 250 C, evolution was negligible. Preliminary design consideration equations are given for an adsorption bed for the holdup of radioactive noble gas releases from the Fast Flux Test Facility; major factors are the holdup efficiency of the charcoal, removal of decay heat from the charcoal beds, and the pressure drop across the charcoal beds. Initial planning is complete for the 11th AEC Air Cleaning Conference in Richland, Wash., Aug. 31 Sept. 3, 1970. Announcements of the conference have been sent to several journals and approximately 600 invitations have been mailed to interested personnel. Abstracts are due June 1, 1970. The program will be distributed about June 15.

11212 APTIC NO. 27503

Morse, Tony

CLEAN AIR: IT'S UP TO OIL MEN, SAY CAR MAKERS. *Engineer (London), 230(5951):14, Feb. 12, 1970.*

American car manufacturers claim that they have cut pollution drastically through engine design changes and hardware devices. In appealing to the oilmen to produce a lead-free gasoline, the chief of Atlantic Richfield announces that his company plans to sell lead-free gasoline in California by the end of 1971, providing the motor companies can produce an engine which will run on it. Accepting that lead alkyls are essential at present as an antiknock agent, there are four good reasons for eliminating, or at least reducing the tetraethyl lead and tetramethyl lead additives. Health hazards are one argument against them, while they also tend to deactivate the catalysts used in pollution control systems. Tetraethyl lead tends to inhibit hydrocarbon oxidation in the combustion chamber, thus increasing hydrocarbon emissions. Lead and/or lead scavengers used with tetraethyl lead detract from lubricant performance and exhaust system durability. The problem in Britain is small compared to the U. S., with tetraethyl lead additions at about 2 ml/gal as compared with up to 4 ml/gal. However, recent studies on carbon monoxide in city centers show that there is a marked fall-off in driver reaction in summer congested traffic. Volatility directly affects vehicle efficiency and also the evaporative emission control devices. Olefin content is also important, but engine combustion produces reactive olefinic compounds even when they are absent from the fuels.

11213 APTIC NO. 27507

First, Melvin W. and Frederick J. Viles, Jr.

CLEANING OF STACK GASES CONTAINING HIGH CONCENTRATIONS OF NITROGEN OXIDES. *Preprint, Air Pollution Control Assoc., Pittsburgh, Pa., 28p., 1970. 8 refs. (Presented at the Air Pollution Control Association, Annual Meeting, 63rd, St. Louis, Mo., June 14-18, 1970, Paper 70-70.)*

Multistage gas absorption of 1-50% nitric oxide, nitrogen dioxide, and nitrogen tetraoxide from air with water, caustic or caustic permanganate solutions, can produce colorless stack discharges. The rate at which NO is oxidized to NO2 in the gas phase, as well as the solubility rate of NO2 in water or solution, is highly concentration dependent so that reductions of stack gas concentrations of nitrogen oxide below approximately 200 ppm appear to be impractical. System design information and test data are presented for rocket fuel systems and metal etching systems. Scrubbing efficiency is mentioned. Increasing NOx concentrations by limiting dilution with air prior to entrance to a gas absorber results in significant reductions in the mass emission rate of NOx and substantial saving in treatment cost. This makes it imperative to design the process and the safety facilities associated with it, such as local exhaust ventilation, to reduce to a minimum the influx of air and other inert gases. Ideally, processes giving off nitrogen oxides should be totally enclosed and placed under sufficient negative pressure to draw off all evolved fumes under the prevailing interior temperature but not so great as to induce significant air leakage. (Author abstract modified)

11214 APTIC NO. 27520

Underhill, Dwight W., Parker C. Reist, and Ronald Hurley

DETERMINATION OF THE INTERPARTICLE VOID VOLUME IN PACKED GRANULAR BEDS FROM AEROSOL BREAKTHROUGH CURVES. *Harvard Univ., Boston, Mass., Harvard Air Cleaning Lab. and Atomic Energy Commission, Washington, D. C., Div. of Reactor Development and Technology, Proc. At. Energy Comm. Air Cleaning Conf. 11th, Richland, Wash., 1970, p. 635-652. 1 ref. (Aug. 31-Sept. 3.)*

NTIS: CONF 700816, Vol. 2

Accurate measurement of the interparticle void volume is required for understanding the mass transfer phenomena that takes place in packed granular beds. For many beds, conventional measurement techniques are unsatisfactory because of inaccuracies or because they may alter the bed in some way. It is shown that the interparticle porosity of a packed bed can be accurately determined from the breakthrough curve of a flow stream of aerosol. This method uses the statistical moments of the aerosol breakthrough curve. From the zeroth moment, a rate constant is found which describes the rate of aerosol removal by collisions between the aerosol particles and the granules in the packed bed. This collision rate factor is used to remove the effect of aerosol loss from the breakthrough curve data, after which the first and second statistical moments are calculated. The interparticle porosity is determined from the first statistical moment, while the effective interparticle diffusion coefficient is determined from the second statistical moment in combination with the first statistical moment Breakthrough curves obtained from beds of Raschig rings and Berl saddles were analyzed by this method and compared to results of conventional measuring techniques. (Author abstract modified)

11215 APTIC NO. 27523

Annis, Jason C.

PARTICLE BOUNCE AND AIR FILTRATION THEORY. *Preprint, Air Pollution Control Assoc., Pittsburgh, Pa., 37p., 1970. 14 refs. (Presented at the Air Pollution Control Association, Annual Meeting 63rd, St. Louis, Mo., June 14-18, 1970, Paper 70-128.)*

Particle bounce phenomena in mechanical filtration was studied to enable predictions of filter performace to be made where it is significant. As a first step, a new derivation of sieving relations was achieved, using residence time upon the sieve before passage as the random variable, rather than the event of the passage. A new theory was finally developed, stating that the distance a particle traveled into a filter before collection is a log-normally distributed random variable. This new particle bounce filtration theory was confirmed by a series of experiments covering a range of particle size, particle surface configuration, fiber size, fiber type, density of fiber packing, and filter air velocity. The five test aerosols were paper mulberry pollen, ragweed pollen, rabbit bush pollen, lycopodium spores, and sunflowe pollen. Good correlation was found between the log-normal distribution parameters and filtration parameters. However, it required assignment of two sets of arbitrary constants, one for spicular particles and the other for non-spicular. The exact point at which particle bounce ceases to be important, that is, when classical filtration theory again becomes valid, should be determined more precisely. (Author summary modified)

11216 APTIC NO. 27529

Hamblin, R. J. J. and T. Fujii

SULFOXEL: A NEW ROUTE TO ABATEMENT OF SULFUR DIOXIDE POLLUTION. *Preprint, Japan Petroleum Institute, Tokyo, 18p., 1971. (Presented at the Japan Petroleum Institute Meeting on Desulfurization and Reclamation of Waste Gas, Tokyo, Feb. 25-26, 1971.)*

The Sulfoxel process is a wet scrubbing process designed to reduce the sulfur dioxide content of power plant stack gases to a few ppm and to reduce the collected SO2 directly to elemental sulfur. Scrubbing is done in two stages with an nonvolatile aqueous absorbent. The first stage uses a venturi scrubber to saturate the flue gases and to obtain particulate removal at low pressure drop. The second stage uses a Turbulent Contact Absorber to secure the highest SO2 removal at the lowest pressure drop. The scrubbing solution is regenerated by contacting it with reducing gas over a fixed bed of a proprietary catalyst. The catalytic process is insensitive to reducing gas composition and to the presence of contaminants such as hydrogen sulfide, carbonyl sulfide and carbon disulfide. Therefore, the reducing gas can be produced by steam-methane reforming, steam-naphtha reforming, or by partial combustion. The reduction reaction proceeds at fairly mild conditions, and the reducing gas is essentially completed consumed in a single pass. The reactor products are liquid sulfur, an aqueous phase, and a vapor phase.

11217 APTIC NO. 27531

Meintjes, J.

DEALING WITH DUST AND FUME FROM ELECTRIC FURNACES AT RAND CARBIDE LTD, WITBANK. *S. African Mech. Engr. (Johannesburg), 20(11): 373-375, Nov. 1970. 2 refs.*

A 429 ft chimney has proven very effective in dispersing the dust laden gases from the manufacture of both calcium carbide and ferrosilicon in electric furnaces, when a plant based on a multicyclone with dry fabric filtration for collecting the dust in the gases from an electric furnace producing calcium carbide was unsuccessful and had to be scrapped. The assistance of the National Chemical Research Laboratory had been enlisted for determining gas volumes, dust loadings, chemical analyses, and dust particle sizes. Calculations of plume rise and maximum ground level concentrations of the dust emitted from stacks of different heights had been made. At the same time as erecting the chimney, a 65,000 cu ft/min plant was installed to extract the fumes arising when tapping the molten products from the two furnaces and to inject them into the ducting leading to the tall chimney.

11218 APTIC NO. 27532

Roberts, Robert

DESIGNING FOR FLUOROPLASTIC LININGS. *Chem. Eng., 78(5):138-144, Feb. 22, 1971.*

The three important limitations of fluorocarbons in constructing a scrubber are permeability, a high coefficient of expansion, and a difficulty in forming. Since corrosive materials that permeate a fluorocarbon lining can attack the metal support behind the fluorocarbon, there is a minimum effective thickness for the linings. Under the influence of temperature, a fluorocarbon lining will expand about 14 times as much as its supporting steel structure. Scrubber design is discussed, including bed height-to diameter ratio, distribution systems, and nozzle arrangements, which have a marked effect on fabricating costs.

11219 APTIC NO. 27534

Morohashi, Kazuo

BATTERIES FOR ELECTRIC CARS. *(Denki jidosha no denchi). Text in Japanese. Denshi Kagaku (Electronic Sci.), 21(2):71-76, Feb. 1971.*

Although battery-operated automobiles would have certain merits compared with traditional cars, their batteries are currently too heavy and their maximum speed and acceleration rates too low. Batteries for automobiles should be light and yet provide maximum energy and power. They must also be inexpensive, easy to handle and maintain, and long-lasting. The characteristics of such currently used batteries as lead, nickel-cadmium, and silver-zinc are described. New batteries under study include zinc-nickel, zinc-air, sodium-sulfur, lithium-chlorine, lithium-halogenide, and others. Fuel cells, such as hydrogen-oxygen and hydrazine-air, are being considered for trucks and buses. Since the electric automobile is an antipollution measure, every effort should be made to perfect these new batteries and to improve the energy density of existing lead batteries.

11220 APTIC NO. 27538

Buick, K.

CHARACTERISTIC DIFFERENCES BETWEEN A THREE PHASE DUST ARRESTER AND A CYCLONE. *(Charakteristische Unterschiede zwischen dem Drehstroemungsentstauber und dem Zyklon). Text in German. Chem. Ing. Tech., 42(12):848, June 1970.*

Comparative measurements involving a three-phase dust arrester of 200 mm diameter, a cyclone of 200 mm, and one of 324 mm diameter revealed that their dust extraction capacity was about the same; the cyclones had a markedly lower energy consumption. Up to a pollution level of 50 g silica dust/cu m air, the performance of the three machines was independent on the dust load. Wear was greater in the cyclones than in the three-phase dust arrester. Because of the high operating cost, three-phase dust arresters are indicated only for highly abrasive dusts and where, aside from dust separation, other functions are also demanded, such as in the cooling and separation of dust from hot gas streams. The three phase dust arrester can be viewed as a cyclone whose main stream enters on top tangentially, continues in a rotating manner downward on the outside, then turns upward on the inside, the rotary flow of which is caused by secondary air. The dust-laden crude gas enters as a rotating nuclear flow from below and passes through the cyclone flow in an upward direction. In most cases, both flows are of the same order of magnitude, but the secondardy air has a considerably greater rotary impulse and thus determines the character of the total flow.

11221 APTIC NO. 27541

Yamamura, Yoshio and Michimoto Hirabayashi

SMOKELESS, ODORLESS INCINERATOR FOR REFUSES. *(Jinai no muen mushu shokyaku sochi). Text in Japanese. (Daido Enka Kogyo K. K. (Japan)) Japan. Pat. Sho 45-8948. 4p., March 31, 1970. (Appl. Dec. 3, 1966, claims not given).*

An economical, smokeless and odorless incinerator is presented that can be built in a compact size according to individual need for use such as in a small factory or a household. Although in central, large-scale, incineration equipment, since the heat is often utilized for power generation, it is economical to heat generated gas to 800 C or higher in order to remove bad odors, and smoke by means of a red-hot chamber provided at the exit to the chimney stack; in a small-scale incinerator for individual use, it is not. The new incinerator for small factory or individual household use can incinerate even organic refuse without generating visible smoke or a bad odor. A dry distillation kiln is built into the incinerator. The kiln has a cover on the top side and a bottom lid, and a gas-discharge pipe on one side near the top. The gas-discharge pipe is led into the auxiliary fuel combustion chambe next to the bottom of the incinerator. This auxiliary fuel combustion chamber has a burner, a secondary air-intake port and a gas-mixing combustion cylinder equipped with spiral blades. The chimney is in the upper part of the side wall of the incinerato opposite to the gas discharge pipe, while a small air blower is installed outside of the bottom of the incinerator and is connected to the kiln through the wall by means of an air-feeder pipe. Refuse is put into the kiln through the top. As the burner in the auxiliary fuel combustion chamber is ignited, auxiliary fuel, together with secondary air taken in, burns at a fairly high temperature. Hot gas generated by the combustion goes through the cylinder into the channel formed between the inner wall of the incinerator and the outer wall of the kiln and is let out through the chimney. As the hot gas goes through the channel, the kiln is sufficiently heated to volatilize the refuse. The gas is then led into the auxiliary fuel combustion chamber through the gas-discharg pipe, mixed with burner gas there, and circulated into the gas channel of the incinerator to heat the kiln. It is then discharged thus completely deodorizing the volatilized refuse that causes the bad odor, making the smoke invisible. When gas is no longer generated in the kiln, and air, which has been heated to 400 C or higher is blown into the kiln to burn the remaining refuse therein. The combustion gas, carbon dioxide, generated in the kiln is circulated through the gas-discharge pipe, the auxiliary combustion chamber, the cylinder, and the channel to heat the kiln again and is finally discharged through the chimney.

11222 APTIC NO. 27543

Tominaga, Hiroo

SULFUR COMPOUNDS IN PETROLEUM AND THEIR REMOVAL. *(Sekiyuchuno iokagobutsu to sono datsuryu). Text in Japanese. Preprint, Japan, Chemical Society, Tokyo, 6p., 1971. (Presented at the Organic Sulfur Chemistry Conference, 5th, Tokyo, Japan, Feb. 8, 1971.)*

The desulfurization of oils utilizes knowledge of non-hydrocarbon components, especially sulfur compounds. Due to the recent progres in physicochemical analysis, the components of heavy residues are gradually being disclosed. Total sulfur in the oil is quantitatively determined by weighing sulfur dioxide obtained by combustion. Sulfur content of oils imported to Japan are shown in tabular form. Sulfur compounds in the oil are inorganic or organic The former are hydrogen sulfide and elemental sulfur, both in extremely small quantities. The latter includes mercaptans, aliphatic or aromatic sulfides and disulfides, and thiophene. Basi studies on the sulfur compounds, namely separation, identification, quantitative analysis, synthesis, and property measurements in progress in the U. S., England, France, and the Soviet Union. Some of the results obtained by American research institutes are described. The main point in gasoline desulfurization is the removal of mercaptans, which can be extracted by the use of sodium hydroxide or deodorized by a process called sweetening. Kerosine or light oil used to be desulfurized by concentrated sulfuric acid; now it is done by hydro-desulfurization. The same technique cannot be applied to heavy oils, and indirect desulfurization is being employed by most refineries in Japan. To reduce the sulfur content below 1%, however, a direct desulfurization method is required. In Japan there are three plants where this method is employed.

11223 APTIC NO. 27545

Nakai, Yoshiyuki and Tetsuya Yokokawa

PURIFICATION OF SULFUR DIOXIDE GAS BY NEW LIQUID PROCESS. *(Kanakoshishiki gasu kyushu sochi ni yoru aryusan gasu no kyuchaku jokyo). Text in Japanese. PPM (Japan), 2(1):22-30, Jan. 1971.*

Several problems and factors concerning the purification of sulfur dioxide gas by liquid are stated. An illustration of a Kanagawa Prefectural Industrial Laboratory type gas purifier is given. Desulfurization of waste fume is more economical at present than that of crude oil, in regard to plant and operating costs. The active carbon process and activated manganese oxide methods have been adopted as purifiers of petroleum waste fume. The problem with the former method is the prevention of gas flow channeling and the reduction of activity of active carbon with the passage of time The latter method uses solid manganese oxide in spite of its gas reaction system; the control of the solid must be developed for effective operation. On the other hand, absorption of gas by liquid is widely performed. The solvent power of sulfur dioxide gas to water is very small and decreases markedly with a rise in temperature, especially in such low concentrations of gas (1000 2000 ppm) as there is in waste fume; a large amount of cool water is needed for this purpose. Problems of this method are the absorption speed of gas, the structure of apparatus for a long contact period, and achievement of a large contact area between the gas and liquid without losing gas pressure. Water layers of coaxia cylinders were adopted; the gas flows outward across the layers fro the center. The gas flow speed decreases and the contact area of gas to water increases with the advance of the gas. A wide range o liquid-gas ratios for efficient removal of sulfur dioxide gas is permitted in this process. The efficiency of the gas removal was studied; an extreme drop in efficiency was observed at a pH value o less than 6. Basicity is not remarkably efficient for this process since sufficient absorption is realized for the mechanism.

11224 APTIC NO. 27546

MULTI-PHASE FLOWS. *(Mehrphasenstroemungen). Text in German. Chem Ing. Tech., 42(12):845, 1970. 1 ref.*

The meeting of the 'Multiphase Flows' commission of the Society for Industrial Processing Engineering and of the Dust Technology group dealt in individual small group work sessions with cyclone dust arresters, packed towers, whirl layers, gas-fluid flows, the pneumatic and hydraulic transport of solid substances, particle motion and swarm laws, flow through diaphragms and perforated bottoms, and the elaboration of guidelines for technical warranties of pneumatic conveyors. A discussion followed each report.

11225 APTIC NO. 27548

Katayose, Saburo

INCINERATOR FOR BUTCHERY AND SIMILAR WASTES. *(Obutsu shokyakuro). Text in Japanese. (Assignee not given.) Japan. Pat. Sho 45-8396. 4p., March 25, 1970. 1 ref. (Appl. Sept. 20, 1966, claims not given).*

An incinerator is designed to dispose of watery wastes such as butchering and fish processing wastes, including entrails, giblets, plucks, and bones of animals and fish. These wastes, produced in large quantities at a slaughterhouse or fish processing factory, are hard to incinerate, generate bad odors, and require a lot of fuel if incinerated with an ordinary incinerator. The offensive odor and the amount of smoke generated during the incineration have been serious public nuisances. The incinerator offering a solution to these problems is constructed mainly of fireproof bricks. It is divided into two main rooms by means of a brick partition wall. The larger room, the combustion room, has the firs platform projecting from the partition wall, the second platform from the opposite wall, and the third from the partition wall, in sequential order from top to bottom. The smaller room on the other side of the partition wall has a short partition wall erected on the bottom and another still shorter wall suspended under the chimney. A few flame holes are provided above the first platform on the partition wall; the flame throw-in hole is provided on the opposite wall at about the same height with the flame holes. Immediately above the third platform on the partition wall is another flame hole that is twice as big as all the flame holes above the first platform combined. Under the third platform on the partition wall is a still bigger flame hole that is twice as big as the flame hole above the third partition. This relationship is important in that it makes the main fire flames jut downward. As the watery and fat wastes thrown onto the first platform are burned by flames jetted in through the flame throw-in hole, the fat content melts and drops onto the third platform, while the water content evaporates. The flame now runs toward the next larger flam hole, growing bigger as it burns the fat content on the third platform, and heats the wastes under the first platform. The flame then goes through the largest flame hole into the other side of the partition wall where the second and third flame chambers are provided. As the flame goes repeatedly through this main path, the wastes which are defatted and dried on the first platform fall down onto the second platform and are effectively burned by the flame. Gas generated during this process is led into the second and third flame chambers where it is further burned by the flame for the complete combustion that assures deodorization of the gas.

11226 APTIC NO. 27550

Hiraoka, Masakatsu and Yuko Ikeda

CONTROL OF AIR POLLUTION. *(Taiki osen no taisaku gijutsu to kontororu). Text in Japanese. Kagaku Kogaku (Chem. Eng.), 35(1)29-36, Jan. 1971. 46 refs.*

In Japan, the main approaches to the control of pollution involve the reduction of generated contaminants, the diffusion of smoke particles from tall stacks, and research into the dispersion of pollutants. Air pollution by sulfur oxides is due mainly to the combustion of heavy oil, so either the purification of combustion gases or the desulfurization of the oil is indicated. Basic research was conducted in 1968 by the Ministry of International Trade and Industry on such representative dry purification processes as the activated carbon and activated manganese oxide methods. Because wet purification methods are not effective with waste gases in low concentrations, dry methods have been under investigation for years. Other dry methods are the lime-dolomite, alkalized alumina, contact catalyst, and molten carbonate processes Wet methods include the limestone, ammonia, potassium sulfide, and dolomite processes. Another pollution abatement measure is represented by the control of automobile engine exhaust; engine improvement reduces hydrocarbons and carbon monoxide. Removal of nitrogen oxides is also desirable since they, like hydrocarbons, ar the origin of secondary contamination. Three methods of forecastin air pollution are under development -- deterministic, applicative, and statistical. The first uses theoretical formulas to predict concentrations in many cities. The second, which is being applied in Osaka, estimates future pollution trends on the basis of current information. The third will attempt to utilize errors in measured values.

11227 APTIC NO. 27553

Ueda, Akiyoshi

PRECIPITATION OF BLAST FURNACE. *(Koro no shujin). Text in Japanese. Kagaku Kogaku (Chem. Eng.), 35(1):47-53, Jan. 1971.*

The main sources of dust and particles at blast furnace installations are the conveyor for raw materials, the casting bed, and the blast furnace gas. A well-designed suction hood over the conveyor will control airflow; the air itself can be cleaned by wet collision-type cleaners or bag filters. Slurry from the wet cleaners is disposed of by adding it to the thickener used to purify blast furnace gas. Large-scale blast furnaces requiring an airflow of more than 7000 cu m/min can employ an air curtain to abate the wind effect and reduce dust density from 2-5 gr/cu nm to 0.2 gr/cu nm. The size distribution of dust generated by the casting bed is smaller than that of conveyor dust; about 70% of it is less than 30 micron. In terms of quality and pollution control, the purity of blast furnace gas should be 5-10 micrograms/cu nm. Components of the gas are carbon dioxide (18.4%), carbon monoxide (23.5%), hydrogen (3.3%), and nitrogen (54.6%). A dust collector will collect particles larger than 100-300 micron. A venturi scrubber has the advantage that its slot can be varied to correspon to changes in furnace operations. Only wet electrostatic precipitators can be used with blast furnace gas. Their waste water is treated, together with that from the scrubber, with a thickener.

11228 APTIC NO. 27555

Saburo, Tsuji and Minoru Kuwabara

A STATIC DUST COLLECTING METHOD. *(Seidan shujin hoho). Text in Japanese. (Hitachi, Ltd., Tokyo (Japan)) Japan. Pat. Sho 45-26156. 2p., Aug. 28, 1970. (Appl. Sept. 13, 1965, claims not given).*

An electrostatic dust collection method is described, based on the addition of vanadium compounds to change the characteristic of fine dust particles emitted, together with sulfur dioxide, from a coal burning furnace. The vanadium promotes the collection of dust by lowering its specific electrical resistance. No special facilities are required, since the vanadium ore is charged along with the fuel and is burned and pulverized. The invention reduces the need of Cottrell precipitators for large amounts of water to prevent the dislodgement of dusts with a specific resistance exceeding 10 to the 12th power Omega cm. These dusts are easily dislodged because of inverse ionization occurring between the surface of the dust collecting electrode and the accumulated dust layer. Because of th reduced water requirements, the invention is practical for large thermal power stations.

11229 APTIC NO. 27557

Lawrie, N.

SOVIET PROCESS SLASHES SULFURIC-ACID-MAKING COSTS. *Chem. Eng., 78(6):81-83, March 8, 1971.*

For years, production of acid from pyrites and sulfur ores has followed a sequence of roasting the raw material to produce a sulfu dioxide containing gas; washing, cooling, and drying that gas; reheating it and then converting the SO2 to sulfur trioxide; and finally absorbing the SO3 to yield sulfuric acid. A new Soviet process instead passes the hot gas directly from the roaster to the converter, which turns up a big advantage in capital and operating costs. Other advantages include smaller overall pressure drops, less water consumption since the roaster gas is not cooled prior to conversion, greater steam production, and less operator time and maintenance. The process utilizes a special catalyst designed to withstand dust slippages. Operation in a full scale plant is mentioned, and variables of the process are indicated.

11230 APTIC NO. 27559

Oshiashi, Yoshimi

A NEW ELECTRIC DUST COLLECTOR. *(Denki shujinki). Text in Japanese. (Assignee not given.) Japan. Pat. Sho 45-26558). 5p., Sept. 1, 1970. (Appl. Dec. 20, 1965, claims not given).*

A compact and efficient electric dust precipitator is described, in which the electrodes can be cleaned both sufficiently and simply. Insulating tape for the electrodes is made of vinyl chloride, polyethylene or a similar material, while an electric conductive paint is applied to their surface, such as an adhesive mixed with metal or graphite powder. The electricity is charged or grounded, alternately, the dust can be brushed off easily. In the case of the grounding part of the electrode, both sides of the insulating tape are covered with a conductive film, while the conductive film of the dust collecting part is interspersed with spaces capable of withstanding the voltage. Cleaning is performed by simply transferring the electrode tape. A high dust collecting efficiency can be maintained if it is done once a day. If the conductive film is made to maintain a high resistance, discharge (arcing) due to dust can be prevented, and the gap between the electrodes can be made small. The manufacturing cost of this type of electrode is small.

11231 APTIC NO. 27561

Ninomiya, Nobutaka, Hirohiko Ichikawa, and Hiroshi Nishino

METHOD OF REMOVING SULFUR DIOXIDE FROM GASES. *(Takeda Chemical Industries, Ltd., Osaka (Japan)) U. S. Pat. 3,544,263. 3p., Dec. 1, 1970. 2 refs. (Appl. Jan. 13, 1967, 9 claims).*

While sulfur dioxide can be removed from gas streams by the conventional activated carbon method or by the use of metallic oxides, neither method is satisfactory from an industrial viewpoint. The removal efficiency of the former is not adequate and the latter requires high temperatures. The present invention overcomes these disadvantages by using a carbon obtained from the gasification of an admixture of bituminous coal and inorganic sodium or potassium compounds. The sodium or potassium is admixed with the coal in an amount equivalent to the K or Na atom/100 grams of coal (about 5 to 75% mg). The admixture is first carbonized, preferably at 45-700 C, then gasified, at 750-1100 C, to a gasification yield of about 20-40 wt percent. Sulfur dioxide contacted with the resulting carbon is oxidized to SO3 and is subsequently converted to sulfuric acid.

11232 APTIC NO. 27563

Kalmykov, A. V., V. N. Tyukanov, M. T. Gubanov, and A. M. Dolzhenko

INDUSTRIAL INVESTIGATIONS OF THE WET DUST CATCHER APM-IGI ON A DRYER-TUBE. *(Promyshlennyye issledovaniya mokrogo pyleulovitelya APM-IGI na trubke-sushilke). Text in Russian. Koks i Khim., no. 12:6-8, 1970. 3 refs.*

An APM-IGI dust catcher with a capacity of 75,000 cu m/h was tested in conjunction with an industrial drier. Operation with a conical nozzle gave 95.3-96.0% coal-dust removal (a reduction from 1.16-2.6 g/cu m to 0.02-0.04 mg/cu m), reflecting a 1.5-2% greater efficiency than was achieved with a disk nozzle. Water consumption rate was 150-175 g/cu m.

11233 APTIC NO. 27564

Gatushkin, A. A. and S. M. Solonin

TWO-LAYER FILTERS FOR FINE FLUID PURIFICATION. *Soviet Powder Metallurgy and Metal Ceramics (English translation from Russian of: Poroshkovaya Met., no. 7:547-550, July 1969. 5 refs.*

A two-layer filter for aviation hydraulic fluid was developed that has a purification fineness of five micron and acceptable permeability. The filter consists of a fine purification layer, of 1 mm thickness and approximately 75% porosity, and a protective layer, of 2.5 mm thickness and approximately 55% porosity. The fine-purification layer was obtained by sintering carbonyl nickel powder, while the protective layer was obtained by sintering the 0.15-0.28 mm fraction of stainless steel powder. The filter is pressed in the form of a disk 50 mm in diameter.

11234 APTIC NO. 27565

Gatushkin, A. A. and A. G. Kostornov

INVESTIGATION OF FIBER FILTER MATERIALS. *Soviet Powder Metallurgy and Metal Ceramics (English translation from Russian of: Poroshkovaya Met., 8(80):651-653, Aug. 1969. 7 refs.*

A filter with increased sludge capacity and a purification fineness of eight micron was obtained by sintering an 0.5-mm layer of carbonyl-nickel powder, of 70% porosity, onto a 2-mm layer, of 40% porosity, of extruded nickel fibers. The filtration ability of the extruded fiber filter was observed to be much higher than that of filters from smooth, chopped wire due to a decrease in fiber porosity and diameter.

11235 APTIC NO. 27566

Chudnovskii, A. M., V. K. Shestopalov, N. P. Fedorov, V. A. Minko, V. I. Slyshchenko, A. N. Serbin, Yu. N. Kavchenko, and N. G. Abramkin

DUST EXTRACTION AT HANDLING SITES FOR GRANULAR MATERIALS. *Refractories (USSR) (English translation from Russian: Ogneupory), no. 1:61-62, Jan. 1970. 1 ref.*

An aspirator for magnesite dust was enclosed in a housing having double walls and a rigid internal baffle. The housing completely eliminated the emission of dust at magnesite unloading and discharging sites, reducing the dust content of the air at the sites by a factor of 2.5-3.0.

11236 APTIC NO. 27597

Semrau, Konrad T.

CONTROL OF SULFUR OXIDE EMISSIONS FROM PRIMARY COPPER, LEAD, AND ZINC SMELTERS--A REVIEW. Preprint, Air Pollution Control Assoc., Pittsburgh, Pa., 39p., 1970. 140 refs. (Presented at the Air Pollution Control Association, Annual Meeting, 63rd, St. Louis, Mo., June 14-18, 1970, Paper 70-97.)

The methods of control of sulfur dioxide emissions from primary copper, lead, and zinc smelters are reviewed. The principal barrier to control is economical rather than technical. The processes of copper, lead, and zinc smelting are described. Method for control and useful recovery of sulfur oxide emissions are placed into 3 categories: systems producing sulfuric acid; systems producing concentrated sulfur dioxide, either for use as such or as an intermediate in production of some other materials, such as sulfuric acid or elemental sulfur; and systems producing elemental sulfur. Processes described include a conventional gas cleaning and conditioning system for a sulfuric acid plant consisting of scrubbing towers and a wet-type electrostatic precipitator, the Asarco DMA absorption system, the Cominco ammonia absorption system the Lurgi Sulfacid process, the Monsanto Cat-Ox process, the Boliden process, the Asarco Brimstone process, the TGS process, and the Claus process. 27597 Semrau, Konrad T.

11237 APTIC NO. 27604

Maurer, R. H.

CONTROL OF COOLING TOWER MIST. *Preprint, Cooling Tower Inst., Houston, Tex., 7p., 1970. (Presented at the Cooling Tower Inst., Semi-Annual Meeting Aspen, Colo., June 22-24, 1970.)*

The facilities used to solve a visibility problem by control of cooling tower mist emission onto a nearby highway are described. This condition existed from one to ten days per year during certain adverse winter conditions. After study of many types of control facilities, use of natural gas burners to re-heat the exhaust air from the cooling towers was investigated at the suggestion of the Texas Air Control Board and found to be an adequate solution. About half of the fans can be shut down during winter operating conditons. For optimum control, burners should be operated in the stacks where the fans are running. The mist emission from the idle fan stacks blends into the re-heated air from the fan stacks with burners. Safety control features are included in the design. The burners are mounted over the short fan stacks, and in the case of the tall fan stacks the burners are installed through the cowlings. The instantaneous operating cost is high, but yearly cost of operation is lower due to the infrequent need to operate the facilities. (Author abstract modified)

11238 APTIC NO. 27629

Thomas, Dean G.

MUFFLER SELECTION AND DESIGN FOR INTERNAL COMBUSTION ENGINES. *In: Engineering Know-How in Engine Design - Part 18. Society of Automotive Engineers, Inc., New York, SP-359, Rept. 700537, p. 42-57, July 1970. 14 refs.*

Aspects of the design of an exhaust system and of quieting the exhaust noise of internal combustion engines are considered, including discussion of factors relating to gas flow, muffler shell design, theoretical acoustics (reactive and dissipative filters), muffler materials, structural factors, attachment and mounting, and special mufflers. Among the latter are afterburners and catalyst mufflers of current interest as air pollution control devices. Thermal afterburners, thermal exhaust manifold reactors, reduction catalytic devices, oxidation catalyst mufflers, pellet-type diesel and spark ignition engine catalysts, and a core-type catalyst muffler are briefly described. The function of these catalyst mufflers is to complete the process of combustion by oxidation, which ideally would reduce all the carbon and hydrogen compounds to carbon dioxide and water. In the case of spark ignition engines air must be added; for compression ignition engines there is enough air but the odor-forming compounds are oxidized best in the presenc of a catalyst. Because both these functions operate in the presenc of a great amount of atmospheric nitrogen, the tendency is for catalyst mufflers to increase the nitrogen oxides found in the exhaust. Since NOx compounds are contributors to air pollution, further treatment must be considered, possibly by means of a reducing type of catalyst.

11239 APTIC NO. 27658

Koerner, H. J.

DUST FALL MEASUREMENTS IN THE KASSEL AREA. *(Staubniederschlagsmessungen im Gebiet von Kassel). Text in German Gesundh.-Ing., 91(12):351-353, 1970. 2 refs.*

The maximal permissible yearly median concentrations for non toxic dust are 0.42 and 0.85 g/sq m/day for non industrial and industrial areas respectively. Respective maximal permissible peak concentrations (monthly median averages) are 0.65 and 1.3 g/sq m/day. In 1968, dust precipitation measurements were performed in 66 individual sectors within the city limits of Kassel by means of the Bergerhoff device and compared with previously recorded levels. In 47 sectors concentrations of up to 0.21, in the 19 remaining sectors concentrations up to 0.42 g/sq m were established. Thus dustfall in all sectors was within prescribed limits. The reduction of dust concentrations in the industrial suburb of Bettenhausen is attributed to the conversion of a number of large boiler furnaces from bituminous coal to oil.

11240 APTIC NO. 27661

Val'dberg, A. Yu. and V. A. Larin

COMPARATIVE INVESTIGATIONS OF TWO SYSTEMS OF WET CLEANING OF GAS DISCHARGES FROM A CLOSED FERRO-ALLOY FURNACE. *(Sravnitel'nyye issledovaniya dvukh sistem mokroy ochistki gaza, otkhodyashchego ot zakrytoy ferrosplavnoy pechi). Text in Russian. Stal, 30(10): 957-959, Oct. 1970. 7 refs.*

Two types of 2-stage dust collector were operated in parallel on an RKZ-165 closed furnace. The two systems differed only in the preliminary dust removal stage, system I utilizing an irrigation scrubber, system II a venturi scrubber. Power consumption in the two systems was comparable, but water consumption in system II was significantly lower (3-4 l/cu m of gas). Dust content going into the second stage was 2-4 g/cu m in both systems.

11241 APTIC NO. 27665

Tanigushi, Akira and Shuichi Kamoshida

A NEW ELECTRIC DUST COLLECTOR. *(Denki shujinki). Text in Japanese. (Hitachi, Ltd., Tokyo (Japan)) Japan. Pat. Sho 45-28478. 3p., Sept. 17, 1970. 1 ref. (Appl. May 4, 1965, claims not given).*

The conventional dry type of electric dust precipitator was difficult to manage and inefficient to apply to the arc furnace or converter, the exhaust gas volume of which varies extremely, depending upon whether oxygen is blown into the furnace. A wet type electric dust collector is described which eliminates these defects, and can adjust itself adequately to the change in amount of exhaust gas. The present invention is equipped with a discharge electrode and a dust collecting electrode, the latter of which is shaped like a flat bag and filled with water. At the bottom of the dust collecting electrode is a thin board to stabilize the film of water used to collect the dust. If there is much gas to be treated, the water is permitted to overflow the dust collecting electrode, but if the amount of gas is small, the overflow is stopped. When tested under the same conditions, efficiency of the conventional type of dust collector was only 40%, while that of the new dust collector exceeded 85%.

11242 APTIC NO. 27668

Makhneva, T. A. and P. P. Gertsen

ABSORPTION OF CHLORINE AT LOW CONCENTRATIONS FROM GASES BY ALKALINE ABSORBENTS.

J. Appl. Chem. USSR (English translation from Russian of: Zh. Prikl. Khim.), 43(4):781-787, April 1970. 14 refs.

The chemical absorption of low concentrations of chlorine, in the gas phase, by alkaline absorbents was studied in a wetted-wall apparatus. It was determined that when the chemical capacity of the absorbent is greater than 2.3 moles/mole of chlorine, liquid phase resistance is negligible and that the overall coefficients of mass transfer can be taken as equal to the partial gas-phase transfer coefficient. The curve for dependence of the rate of absorption on the chlorine content of the gas can be subdivided into three regions in accordance with the nature of the driving force of the process: the initial region, where the determining step is diffusion of the absorbate in the gas phase; the middle region, where the absorption rate is determined both by diffusion of chlorine from the gas to the interface and by the chemical capacity of the absorbent; and the final region, where the driving force is the chemical capacity of the adsorbent. When the molar ratio of the absorbent to chlorine was over 2.3, the rate of chlorine absorption was almost independent of the nature of the absorbent (caustic soda, sodium carbonate solutions, lime suspensions). A general equation for the absorption of chlorine by alkali absorbents in the concentration range common to waste gases (less than 3%) is derived. (Author conclusions modified)

11243 APTIC NO. 27670

Nakagawa, Kazo

EMISSION SMOKE DESULFURIZATION METHODS GIVING ECONOMICAL MERITS.

(Meritto chushin no haien datsuryu shori hoshiki). Text in Japanese. PPM (Japan), 1(1):31-39, Sept. 1970.

The removal of sulfur oxides from exhaust gases of heavy fuel oils with a high sulfur content is reviewed from an economic point of view. Desulfurization of exhaust gases is particularly important in Japan for the prevention of air pollution as 90% or more of the crude oil is imported from the middle east and near east where unusually high sulfur oils are produced. In addition to control of the heavy fuel combustion smoke, a lime-gypsum method is described which also intends to produce gypsum as a by-product. With introduction of the rotary atomizer, it has become possible to manufacture gypsum from sulfurous acid lime. Another advantage is to avoid water pollution with sulfurous acid lime. In a 250 MW power plant operating on a high sulfur heavy fuel oil, it is estimated that 96,325 tons a year of gypsum can be produced as a by-product of desulfurization. The production cost of gypsum per ton is estimated at $8.47 compared with its market price of $7.00. The exhaust gas desulfurization cost per ton for heavy fuel oil is $1.04, and the fuel expense saving compared with the consumption of ordinary heavy fuel oil amounts to 857.5 million yen ($240,000). Similarly, the ammonia-ammonium sulfate and Wellman-Rhode methods were anlyzed. The desulfurization cost per KWhr is estimated at $.00018 with the former and $.0006 with the latter.

11244 APTIC NO. 27674

Inoue, Tatsuo

DEODORIZATION OF RANK ODORS.

(Akushu no Jokyoho ni tsuite). Text in Japanese. PPM (Japan), 2(2):48-52, Feb. 1971.

Elimination of offensive smells is reviewed, and a process of low temperature deodorizing by catalyst is introduced. Substances causing odors are discussed. The features of odor substances are as follows: 1) gas or volatile substances; 2) molecular weight of 30-300; and 3) a molecular size of 3-10 A, as in chemicals such as amines, mercaptans, and such groups as nitro, nitrile, hydroxyl, ketone, aldehyde, and carboxyl. A strong odor is expected with substances containing sulfur or nitrogen atoms in their molecules. Generally, a high unsaturation of an organic compound gives a strong odor. Odors become stronger as the number of carbon atoms in a molecule increase, and the nature of the smell differs with the number of atoms. The minimum amount of odor that can be sensed is called the threshold of the sense of smell. Most rank odors substances are hygroscopic; they tend to form mist from water in the air. Natural and artificial sources of odor are considered. Deodorization methods include: 1) dilution by air (strong deodorization is from oxygen or ultraviolet rays in this case); 2) ventilation or draft (essential for indoor or basement areas); 3) adsorption (use of substances such as active carbon); 4) purification (in the case of gas); 5) combustion (at high temperature for organic substances with rank odors); 6) chemical treatments; and 7) biochemical treatments. Deodorization of large amounts requires mainly methods 5, 6, or 7. For method 5, a low concentration of odor substances requires temperatures higher than 800 C. However, low temperatures can be employed if a catalyst is used; this works in the range of 250-400 C. High deodorization efficiency is expected for the contact oxidation method. Features of this method are the lack of regeneration problems and the long life of catalysts. Several kinds of catalysts are arranged according to odor types.

11245 APTIC NO. 27686

Stephens, Ruth E.

METHOD OF DECOMPOSING NITROGEN OXIDES.

(Ethyl Corp., New York) U. S. Pat. 3,545,917. 3p., Dec. 8, 1970. 4 refs. (Appl. Oct. 10, 1967, 8 claims).

A catalyst is provided capable of rendering oxides of nitrogen from automobile exhausts less noxious. The gas stream of an internal combustion engine is contacted with either praseodymium oxide or lanthanum oxide at a temperature above about 400 C, thus reducing the nitric oxide content of the gas. Suitable supports for the catalyst may consist of zirconia, calcium aluminate, alumina, magnesia, silica, silica alumina, zinc oxide, zircon, mullite, and kaolin, or mixtures of these materials, containing from 0.001 to 25 weight percent active agent. Preparation of the catalyst is indicated.

11246 APTIC NO. 27687

Frundl, Ronald J., Victor W. Hanson, Robert M. Jamison, and Orlan M. Arnold

AFTERBURNER SYSTEM FOR CUPOLA FURNACE.

(Ajem Labs., Inc., Livonia, Mich.) U. S. Pat. 3,545,918. 6p., Dec. 8, 1970. 2 refs. (Appl. Feb. 21, 1968, 11 claims).

An afterburner system for use on cupola furnaces is described, wherein a series of burners are arranged near the charging opening of the cupola stack to ignite and combust the carbon monoxide gas emitted during furnace operation as it leaves the furnace bed. The afterburner raises the stack gas temperature thereby permitting complete combustion of high molecular weight organic compositions and minimizing the amount of free air pulled in through the charging opening. Positioning of some of the early designed afterburners did not facilitate efficient operation or temperatures sufficient to burn the CO and organic residues. These organic residues often result from the use of scrap metal in the furnace along with materials such as coke, flux, and iron. On a great deal of this scrap metal, oil and grease and other organic material including paint and similar surface coatings are present in appreciable quantities. (Author abstract modified)

11247 APTIC NO. 27688

Lutchko, John R. and George R. Stoneburner

METHOD OF REMOVING CARBON MONOXIDE FROM GASES. *(Calgon Corp., Pittsburgh, Pa.) U. S. Pat. 3,545,915. 3p., Dec. 8, 1970. 6 refs. (Appl. July 19, 1967, 9 claims).*

Carbon monoxide is removed from a gas mixture continuously at an elevated temperature by passing the gas mixture over copper and hexavalent chrome compound impregnated on a support of high surface area, preferably activated carbon, by introducing sufficient oxygen to stoichiometrically convert the CO to carbon dioxide. The temperature should be at least 50 C. This method is suitable for removing CO from nitrogen, ammonia synthesis gas, flue gases, automobile exhausts, home heater exhaust gases, hydrogen, and other gases. If the CO_2 formed is not wanted, it can be removed by activated carbon impregnated with 5-50% monoethanolamine. (Author abstract modified)

11248 APTIC NO. 27689

Pedersen, Bjarne

EXHAUST GAS TREATMENT. *(Assignee not given.) U. S. Pat. 3,545,201. 5p., Dec. 8, 1970. 10 refs. (Appl. Aug. 22, 1969, 6 claims).*

An exhaust gas treatment system for an automotive vehicle includes reactor means defining a gas treatment region and having a gas inlet connectable to the exhaust manifold and a gas outlet. Gas deflector means are disposed in the reactor for imparting a turbulent movement to the exhaust gas entering the reactor, while apparatus is included for delivering air into the gas treatment region to combine with the exhaust gas to burn carbon monoxide and unburned hydrocarbons. Filter means are connected to the gas outlet. Previous techniques involved expensive catalysts or relatively large quantities of water which needed frequent renewal.

11249 APTIC NO. 27690

Young, Bernard W.

AIR CLEANING APPARATUS. *(Assignee not given.) U. S. Pat. 3,545,181 15p., Dec. 8, 1970. 14 refs. (Appl. May 7, 1968, 11 claims).*

An air cleaning apparatus is described for separating air from particulate solid matter entrained therein which comprises a wall defining a generally cylindrical chamber with an open end, a substantially tangential air entrance opening in the wall extending parallel to the axis of the chamber, and a solids discharge slit in the chamber wall angularly spaced from the entrance opening. A blower causes air to flow in a stream through the entrance opening, swirling and moving axially in the chamber, and out the open end. Thus, the entrained solid matter is thrown out centrifugally from the swirling air and passed through the discharge slit. An air flow surface cleaning apparatus includes a pick-up head mounted for movement over and adjacent to the surface to be cleaned, duct means for delivering air under pressure from the blower discharge to the pick-up head, and duct means for delivering air from the pick-up head to the tangential air entrance for return flow through the chamber. (Author abstract modified)

11250 APTIC NO. 27692

Nekipelov, V. N. and L. A. Kasatkina

ISOTOPIC EXCHANGE OF CARBON MONOXIDE ON ZINC OXIDE. *Kinetics Catalysis (English translation from Russian of: Kinetika i Kataliz), 11(4):751-755, July-Aug. 1970. 13 refs.*

Experiments were conducted to determine the influence of carbon dioxide adsorption on the kinetics of homomolecular carbon monoxide exchange on zinc oxide, the effect of CO_2-treated zinc oxide on homomolecular exchange in CO, the rate of isotopic exchange between CO and CO_2 in the surface of zinc oxide, and the rate of isotopic exchange between CO and oxygen on the surface of zinc oxide. At low temperatures, exchange in CO molecules proceeds without participation of the catalyst oxygen through complexes of two or more adsorbed CO molecules weakly bound to the surface. At high temperatures, exchange takes place by means of complexes between the adsorbed CO and the oxygen of the zinc oxide. Exchange of oxygen isotopes between CO and CO_2 takes place through exchange with the catalyst oxygen. The adsorbed CO is desorbed only in the form of CO and the adsorbed CO_2 only in the form of CO_2. However, experimental data indicate still another type of interaction between CO and the zinc oxide surface; in this process adsorbed CO can be desorbed as CO_2. The comparatively low rates of the processes described indicate a high energy for the bonds between the adsorbed complexes and the zinc oxide surface.

11251 APTIC NO. 27767

Wagner, Carl

THE REDUCTION OF CARBON MONOXIDE COMBUSTION RATE ON NICKEL OXIDE AS CATALYST BY DOPING WITH GALLIUM OXIDE. *(Beitrag zur Deutung der Verminderung der Geschwindigkeit der Kohlenoxidverbrennung an NiO als Katalysator durch Dotierung mit Ga_2O_3). Text in German. Ber. Bunsenges. Phys. Chem., 74(12):1270-1273, Dec. 1970. 19 refs.*

The rate of combustion of CO on NiO as catalyst at 300 C is considerably lower when the catalyst is doped with Ga_2O_3 than when it is not doped. The phenomenon is explained by a new model which assumes that at the surface of undoped NiO complexes of negative O-ions and of positive Ni3-ions are adsorbed on regular cation sites in the uppermost lattice plane. Theoretical analysis disclosed that the surface of NiO doped with Ga_2O_3 was covered predominantly with complexes of absorbed negative O-ions and positive Ga3-ions. If CO reacts with the latter complex the excess electron of the adsorbed O-ion must migrate over a distance of several lattice constants before a reaction with a Ni3-ion inside the bulk catalyst can take place. Accordingly, the rate of CO combustion on NiO doped with Ga_2O_3 is lower than on undoped NiO.

11252 APTIC NO. 27770

Keyser, Douglas E. De

CHIMNEYS, TOO, CAN BE WASHED WITH EASE. *Power, 115(3):96, March 1971.*

Simply by operating vertically the water jet machine used horizontally in burners, washing has been applied to stacks up to 300 ft high. Opposed nozzles rotate while directing high velocity cold water at the interior surfaces of the stack. Water pressure is 2000-3000 psi, depending on the diameter of the stack. The heart of the system is a washing machine which weighs less than 40 lb and is driven by a small air motor.

11253 APTIC NO. 27772

Yegorichev, A. P., V. I. Staritskiy, and L. M. Sumin

ORGANIZATION OF THE EFFORT OF COMBATING POLLUTION OF THE ATMOSPHERE AND NATURAL WATERS BY ENTERPRISES OF THE FERROUS INDUSTRY.

(Organizatsiya raboty po bor'be s zagryazneniyem atmosfery i vodoyemov predpriyatiyami chernoy metallurgii). Text in Russian. Stal, 30(10):960-961, Oct. 1970.

In all-Union conference dealing with the problem of air and water pollution by the ferrous metallurgical industry was held in Novembe 1969 at Khar'kov and was attended by some 300 representatives from the Office of State Construction, the Ministries of Nonferrous Metallurgy, Health, Petroleum Engineering, Petroleum Refining, and Higher and Special Education. Programs directed toward a 70-80% reduction in emissions from the ferrous-metallurgy industry over the coming 5-8 year period were outlined.

11254 APTIC NO. 27773

Loeffler, Friedrich

THE CALCULATION OF CENTRIFUGAL SEPARATORS.

(Die Berechnung von Fliehkraft abscheidern). Text in German. Staub-Reinhalt. Luft, 30(12):497-500, Dec. 1970. 10 refs.

Data about the flow development are needed to calculate the degree of separation and pressure loss of cyclones. Since an exact calculation of the separation process of three-dimensional turbulent flow is not possible, more or less simplified models must be assumed. Two models are described which have been developed recently for evaluating an optimal type of cyclone. The model developed by Barth and Leineweber leads to relatively uncomplicated equations because of great simplifications but the equations can nevertheless be used for the dimensioning of cyclones due to refinements based on experimental results and theoretical considerations introduced by Muschelknautz. The Rumpf, Borho and Reichert model yields complicated equations.

11255 APTIC NO. 27776

Munekata, Eiji

A PROPOSITION CONCERNING THE DESULFURIZATION OF MINERAL OILS.

(Koyurui no datsuryuho ni kansuru hitotsuno teian). Text in Japanese. Nenryo Kyokaishi (J. Fuel Soc. Japan, Tokyo), 50(526): 78-80, Feb. 1971. 10 refs.

Desulfurization of petroleum by super-heated water extraction is described. The idea is based on the successful industrial application of a process for obtaining phenols or oxygen compounds by super-heated water extraction from phenol-containing petroleum produced by the hydrogeneration of coal. The similarity between the nature of oxygen and that of sulfur in their respective compounds was taken into consideration. In preliminary experiments with an autoclave heated to 300 C, 40% desulfurization of heavy oil was achieved. A simple makeshift apparatus was constructed to improve the efficiency by means of a countercurrent extracting system. However, due to a deficiency in the countercurrent feeding device, the experiment did not yield the expected results; only 30% desulfurization of vacuum-distilled light oil was obtained at 230 C. Conditions necessary for the commercial application of the process, were determined. With the resolution of the existing problems in the countercurrent feed system, this method gives every indication of promise for the desulfurization of mineral oils. Additionally, organosulfur compounds obtained by the method are predicted to open up a new field of application.

11256 APTIC NO. 27779

Narita, Kiichi

ON PRELIMINARY DESULPHURIZATION OF MOLTEN PIG IRON.

(Yosen no datsuryu ni tsuite). Text in Japanese. Tetsu to Ko (Iron Steel), 57(2):411-429, Feb. 1971. 34 refs.

Various methods of desulfurizing molten pig iron are reviewed with respect to desulfurization efficiency and agents and operating problems. The methods discussed include: shaking ladle, rotary drum (Domnarfvet), mechanical stirring with either hollow or solid stirrers, high-frequency induction furnaces, blow-in or injection, gas injection/stirring, soda ash, and turbulator. When soda ash is employed as the desulfurizing agent, use of the turbulator or relayed ring methods is recommended. Soda ash desulfurization can be made more effective by increasing the amount of soda ash added and carrying out the process at about 1250 C. Corrosion of the ladle by the soda ash is prevented by using a mixture containing 25% soda ash, 25% fluorite, and 50% lime. Further improvements in desulfurization require a stronger desulfurizing agent such as CaC2. Desulfurization conditions should be such that no graphite becomes mixed with the desulfurization dregs, thus slowing down the reaction rate.

11257 APTIC NO. 27782

Cluzel, J.

TREATMENT OF EFFLUENTS FROM A SULFURIC ACID PLANT.

(Traitement des effluents d'une usine d'acide sulfurique). Text in French. Ann. Mines (Paris), no. 11:63-68, Nov. 1970.

Modern sulfuric acid plants discharge into the atmosphere residual gases containing 0.20 to 0.25% SO2. A desulfurization method worked out by the Societe Azote et Produits Chimiques in Toulouse uses diluted ammonia and recovers 95% of the sulfur contained in the residual gases, one third in the form of sulfuric acid, two thirds in the form of ammonium sulfate. The gas is washed with an ammoniacal solution or with a solution of ammonium carbonate at 20 C until an equilibrium among ammonium sulfate, sulfite and bisulfite is established. The efficiency of absorption depends on the sulfite-bisulfite equilibrium. Maximal recovery requires as low vapour pressure as possible of both SO2 and NH3, especially of NH3, or else an opaque ammonium sulfite fog forms which hinders the operation. This condition is met at a pH between 5.3 and 5.7. The recovered solution is an acid solution of ammonium sulfate which can be further processed in a number of ways. The process is currently in operation on a pilot plant scale with a daily recovery of 150 kg sulfur.

11258 APTIC NO. 27783

Geny, P.

ATMOSPHERIC POLLUTION CONTROL IN THE IRON AND STEEL INDUSTRY.

(Lutte contre la pollution atmospherique dans l'industrie siderurgique). Text in French. Ann. Mines (Paris), no. 11:55-62, Nov. 1970.

The various sources of air pollution within the French iron and steel industry are identified, the control possibilities are outlined and a proposal of a law for pollution control elaborated. The introduction of new steel making techniques has aggravated the pollution problem, in that the use of oxygen in the manufacture of steel has resulted in the emission of red fumes. The principal pollutants are dusts of particle diameters from 10 to 100 micron, fine dust particles containing predominantly red iron oxide particles of a diameter below 10 micron, and sulfur dioxide from sulfur in fuels or minerals. These pollutants are emitted during smelting, during steel making, during steel rolling, during sheet metal treatment, from coke ovens, and from auxiliary installations. Dust collectors in the mineral agglomeration shops remove 95% dust at an investment cost of 8.5% of the total investment. Dust emitted during steel making contains 70-72% Fe304,6-8% Fe203, 7% Fe, 10% CaO, 2.5% P205, silica, and sulfur. The red fumes have a median particle diameter of between 0.08 and 0.12 micron. The purification of this emission is at present not possible because of the enormous cost this would entail, but the dust is not noxious.

11259 APTIC NO. 27787

Lasserre, P.

PRESENT PERFORMANCE OF SEPARATORS; FUTURE OUTLOOK. *(Performances actuelles des separateurs; perspectives d'avenir). Text in French. Ann. Mines (Paris), no. 11:69-76, Nov. 1970.*

The various categories of pollution control equipment are reviewed and summarized. Dust separators, depending on the force or phenomenon acting on the dust and separating it from the gaseous carrier, can be mechanical (where the force is gravity or inertia often combined with centrifugalization), hydraulic (using a liquid, usually water to which softeners or neutralizers are added), porous (where the gas passes through a porous layer retaining dust particles on its surface or in its interior) or electrical (using dust ionization in an electrical field). The first category comprises cyclones, multicyclones and axial cyclones which are of low effectiveness below a dust particle diameter of 10 to 50 micron depending on the type of machine. Hydraulic dust separators moiste dust by a water screen, by spraying or by contact with a moist inert material and are up to 99% effective at a very considerable expenditure of energy. Porous dust collectors generally use a cylindrical fabric (glass wool) sleeve where the gas travels from the inside out; they work with a 98-99% efficiency at a considerabl expenditure of energy and replacement cost. Electric dust collectors work with a 98-99% effectiveness offering low resistance to the gas flow and, while costly, are economical in operation. Prior to this review, it is suggested that consideration of all means of prevention of the generation. Fair pollutants can be of greater value than the control of pollutants after they are generated.

11260 APTIC NO. 27871

Kotera, Toshihide, Naoyuki Todo, Kunihiro Muramatsu, Kiyoshi Ogawa, Minoru Kurita, Toshio Sato, Makoto Ogawa, and Toshiaki Kabe

STUDIES ON THE PREPARATION METHODS AND THEIR EFFECTS ON THE HYDRODESULFURIZATION ACTIVITIES OF MOO3-COO-Al203 CATALYSTS. *(Sanka moribuden-sanka kobaruto (II)-arumina shokubai no choseiho oyobi sono datsuryu kassei nioyobosu eikyo). Text in Japanese. Kogyo Kagaku Zasshi (J. Chem. Soc. Japan), 74(3):330-335 March 1971. 20 refs.*

Two methods for preparing molybdate desulfurization catalysts were studied: infiltration to aluminum oxide and kneading with alumina hydrate. Changes in the molybdate during the preparation process and the effects of the process on the desulfurization activity and porous structure of the catalyst were investigated. Kafuji oil was employed to test the activity. Behavior of the molybdate during preparation varied according to the processing method. The infiltration method gave a higher desulfurization catalyst differed markedly when molybdenum or cobalt was deposited onto a sintered alumina carrier than when they were added in a behemite gel form and subsequently baked to aluminum-oxide-alumina with MoO3 or CoO. The porous volume of the kneaded catalyst of lower desulfurization activity was found to be smaller than that of infiltrated catalyst. Among the alumina carriers, however, a reversed relationship was observed between the desulfurization activity and porous volume. For MoO3-CoO-Al203 catalysts, a certai amount of MoO3 and CoO was observed to be required to yield a certain value of desulfurization activity. The choice of carriers or catalyst preparation methods was concluded to be extremely important in determining the desulfurization characteristics.

11261 APTIC NO. 27984

Hardison, Leslie C.

METHOD AND MEANS FOR TWO-STAGE CATALYTIC TREATING OF ENGINE EXHAUST GASES. *(Universal Oil Products Co., Des Plaines, Ill.) U. S. Pat. 3,544,264. 4p., Dec. 1, 1970. 5 refs. (Appl. Sept. 25, 1968, 6 claims).*

A two-stage catalytic treatment of engine exhaust gases may be accomplished by passing the hot gas stream through an internally positioned catalyst section to effect reduction of nitrogen oxides, and then mixing air with the resulting stream for passage through a second stage catalyst section so as to effect more complete oxidation of carbon monoxide and unburned hydrocarbons. The reduction catalyst which is utilized in the first section may be a copper oxide impregnated on a suitable temperature resistant support material such as aluminum oxide. Also, metal oxides of the iron group may be used. Suitable oxidation catalysts for use in the second stage zone may include the metals of Groups I, V, VI, and VIII of the periodic table, particularly copper, silver, vanadium, chromium, iron, cobalt, nickel, and platinum or palladium. The second catalyst stage should preferably surround the first and assist in maintaining a high temperature in the first catalytic reduction section. (Author abstract modified)

11262 APTIC NO. 28501

Shalamberidze, O. P. and S. E. Partskhalava

SANITIZING THE AIR IN THE GEORGIAN SSR. *Gigiena i Sanit., no 4:96-98, 1970. Translated from Russian. Joint Publications Research Service, Washington, D. C., 5p., June 11, 1970.*

NTIS: JPRS 50713

The rapid industrial growth of the Georgian Republic has created serious air pollution problems. Air quality measurements initiated in the early 1950's showed excessive emissions of various pollutants from, for example, a metallurgical plant complex a chemical complex producing nitrogen fertilizer and caprolactum, a ferroalloy plant, and an oil refinery. Nitrogen dioxide and carbon monoxide concentrations as far as 2000 m from the chemical plant were higher than single and average daily maximum permissible levels. There was evidence that emissions from all these plants were having adversive effects on the health of children living nearby, and steps were taken to reduce the pollution with varying degrees of effectiveness. Air quality studies in the capital city of Tbilisi showed that control measures (e.g., removal of some industrial plants to sites outside the city, conversions to natural gas, tree planting) did succeed in reducing the sulfur dioxide, dust, and soot in the city 2 to 2.5-fold. The occurrence and effects of 3,4-benzpyrene in settling dust were studied, and maximum permissible concentrations for various compounds were established. The present air pollution control program includes systematic monitoring, preventive inspection, enforcement checks, conversion of heating and power units to natura gas, and installation of control equipment in industrial and public buildings. Nevertheless, numerous shortcoming and omissions in the program remain to be corrected for more effective control.

11263 APTIC NO. 28543

Sterba, M. J., W. M. Karmer, and C. W. Selvidge

THE HYDRODESULFURIZATION OF HEAVY FUEL OILS BY THE ISOMAX PROCESS. *Preprint, Japan Petroleum Inst. (Tokyo), 32p., 1970. 3 refs. (Presented at the Japan Petroleum Institute, Tokyo, March 10-11, 1970.)*

Since the greatest burden of sulfur lies in the residual portion of heavy fuel oils, it is expected that, in order to meet the limitations on the sulfur content of fuels, that direct hydrodesulfurization methods exemplified by the Reduced Crude (Rcd) Isomax process will receive increased attention. This process, in commercial use for two years, processes feedstocks originating in Middle Eastern fields. Background data are given for the Rcd Isomax pilot plant which employs a fixed bed catalyst with a hydrogen recirculating system originating from a high pressure receiver. The desulfurization features of the Rcd Isomax process are illustrated by a tabulation of the results obtained from pilot plant processing of four residual feedstocks with sulfur contents ranging from 5.0 to 2.76 wt-%. The objective of these runs was to lower the sulfur content of the reduced crudes to a nominal 1% level in the debutanized product. It was met in these tests with the formation of less than 1 wt-% of chlorine through C4 hydrocarbons, and with only a small shift in the low temperature part of the boiling range of the feedstock. Indirect desulfurization processes, which dehydrosulfurize only the heavy gas oil obtained by vacuum distillation or propane deasphalting, are being applied in the meantime to reduced crudes whose sulfur contents are not intolerably high for meeting the first fuel oil sulfur specifications, and to reduced crudes whose metals contents are excessively high for processing by direct hydrodesulfurization techniques.

11264 APTIC NO. 28547

ENVIRONMENTAL POLLUTION CONTROL SYSTEM OF KAKOGAWA STEEL WORKS. *(Kagogawa seitetsusho kogai boshi taisei). Text in Japanese. Kobe Seiko Giho (Kobe Steel Eng. Repts.), 21(1):19-28, Jan. 1971. 1 ref.*

Sulfur dioxide emissions were controlled at the source by the use of heavy oil with an extremely low sulfur content, and iron ore with a low sulfur content. The heights of approximately 30 stacks were determined on a computer by linear programming so that either the ground concentration for each stack or the total did not exceed the value stipulated in the environmental standard. Wind tunnel experiment were conducted to determine the effects of buildings and the leeward topography around the stacks. The one-hour average of the concentration obtained by the diffusion calculation and the wind tunnel experiment was modified by using the monthly frequency of wind direction to predict a long-term average concentration. As an emergency measure, 10,000 tons of extremely low sulfur oil is constantly stored. The company has its own monitoring stations in addition to prefectural and municipal stations. For dusts, a wet type electrostatic precipitator was employed for particles less than 1 micron. A multicyclone separator, a dry type electrostatic precipitator, a fan and venturi scrubber, and a bag filter were also used. The bag filter was limited to a small scale, because of the difficulty in processing the captured dust. For selecting the capacity of the dust collectors, an inlet speed of 2 to 2.5 m/sec was assumed, with a 20 to 30% reservation. The 60 dust collectors consumed 16,000 kw. Dust covers, water sprinklers, and yard guns were also employed. When necessary, the surfaces of ore and coal depots were flushed with water containing an active sponge agent.

11265 APTIC NO. 28637

Todo, Naoyuki, Toshiakai Kabe, Kiyoshi Ogawa, Minoru Kurita, Toshio Sato, Kazuo Shimada, Yasunori Kuriki, Tooru Oshima, Toshiichi Takematsu, and Yoshihide Kotera

X-RAY MICROANALYTIC STUDIES ON MOLYBDENUM TRIOXIDE-COBALTOUS OXIDE-ALUMINUM OXIDE HYDRODESULFURIZATION CATALYSTS-DISPERSED STATES OF MOLYBDENUM AND COBALT AND DISTRIBUTION OF DEPOSITED VANADIUM AND NICKEL. *Text in Japanese. Kogyo Kagaku Zasshi (J. Chem. Soc. Japan), 74(4):563-568, April 1971. 14 refs.*

Standard samples were prepared by kneading the purest grade of commercially available ammonium molybdate, cobalt nitrate, nickel nitrate, and ammonium metavanadate with gamma-alumina, extruding at 100 C, drying and baking for 3 hrs at 500 C in air. Kafuji heavy oil was employed for the hydrodesulfurization experiment. The sample was molded in a transparent thermoplastic resin, ground with energy paper, buff polished, and vapor deposited with carbon. The finished sample was studied by Shimadzu x-ray microanalyzer EXM2 with LiF and ADP crystals. Dispersion of cobalt tended to be more nonuniform than that of molybdenum on the catalysts prepared by the infiltration method. Vanadium was localized on the outer layer of the catalyst to about 200 micron from the surface. The deposition decreased exponentially toward th center of the specimen. The distribution of nickel was similar to that of vanadium, the former penetrating deeper than the latter. The amount of vanadium and nickel deposits determined by the present analysis agreed with that by fluorescent x-ray analysis. The amount was found to be proportional to the exposure time to the heavy oil. The result may be due to similarities in desulfurizatio rates of the catalysts. The proportionality needs to be confirmed by further experimentation employing catalysts with varied rates of desulfurization. The present study was performed as a part of a project on direct desulfurization of heavy oil.

11266 APTIC NO. 28716

Jelatis, Demetrius G. and Lester W. Haaker

ATMOSPHERE CONTROL SYSTEM FOR MANIPULATOR WALL PENETRATION. *(Central Research Labs., Inc., Red Wing, Minn.) U. S. Pat. 3,560,066. 5 p., Feb. 2, 1971. 2 refs. (Appl. July 3, 1969, 10 claims).*

A protective sealing system against gases or gas-borne substances has been provided for the interior of the horizontal support or through tube of through-the-wall remote control master-slave manipulators, as well as for the annular space between the tubular support and wall openings. The most common use of such manipulators is in the handling of radioactive and other hazardous materials in a dangerous area on one side of a barrier wall from a safe area on the opposite side of that wall where the operator is positioned. In order to prevent endangering of personnel due to the escape of harmful products through the opening in the barrier wall through which the manipulator extends, or to prevent inflow of atmospheric gas into the cell, pains must be taken to minimize or eliminate any openings through which harmful materials can pass. The present system comprises at least two sealing assemblies, spaced apart and disposed in the horizonal tubular support of a manipulator. These assemblies extend transversely to the longitudinal axis of the tubular support and are in close engagement with its interior wall, and have passages for movement of tie rods and linear motion transmission elements. Between the two assemblies is a gas chamber, with fitting means in one of the assemblies for connecting the chamber to a supply of gas under pressure or to a vacuum source. The manipulator tie rods are sealed by booting; the motion tapes and cables pass between felt wipers. Safety of the operator and/or control of the cell atmosphere is insured by maintaining gas under slight pressure in the gas chamber so as to cause controlled leakage outwardly from that chamber in both directions.

11267 APTIC NO. 28786

Hayashi, Hideo, H. Yoshikawa, Tamotsu Teratani, Toshio Hasegawa, Yasumasa Yamada, and Ko Narita

DUSTS TREATMENT IN NONFERROUS METAL MELTING FURNACES. *(Hitetsu kinzoku yokoro no baijin shori). Text in Japanese. Taiki Osen Kenkyu (J. Japan Soc. Air Pollution), 5(1):185, 1970. (Proceedings of the Japan Society of Air Pollution, Annual Meeting, 11th, 1970.)*

So that control measures could be established for metallic fumes, such as copper, zinc, and aluminum, several small nonferrous production plants were investigated. Emissions from a fused-zinc plating factory included ammonium chloride in addition to zinc chloride and zinc oxide. The particulates were very minute, and relatively little zinc was removed although scrubbers and absorption towers were provided. In an aluminum recycling plant, the treatment method was spray scrubbing. The waste gas whose temperature was quite high, consisted fo fumes of salts containing fluorine and chlorine. About two percent of the dust was aluminum; one percent was removed by treatment. Chlorine removal efficiency was about 46% and fluorine was not traceable. In a copper-wire manufacturing plant, the white smoke produced at the time the raw material is fed to the electric furnace and when the bath is taken out was collected by a hood and treated by bag filters. Dust collection efficiency was bout 99%. The amount of copper in the dust was 1 mg/N cu m while that of zinc was 200-300 mg/N cu m.

11268 APTIC NO. 28808

Industrial Gas Cleaning Inst., Inc., Rye, N. Y., Electrostatic Precipitator Div.

BID EVALUATION FORM FOR ELECTROSTATIC PRECIPITATORS. *Ind. Gas Cleaning Inst. Pub., no. E-P 4, 4p., 1968.*

A bid evaluation form for electrostatic precipitators is presented. Columns are included for four bidders to respond to operating and performance data, precipitator arrangement, collection system design, high voltage system details, electrical criteria, auxiliary equipment, and weight information.

11269 APTIC NO. 28809

Industrial Gas Cleaning Inst., Inc., Rye, N. Y., Gaseous Control Div.

GASEOUS EMISSIONS EQUIPMENT PRODUCT DEFINITIONS AND ILLUSTRATIONS. *Ind. Gas Cleaning Inst. Pub., no. G-1, 3p., 1969.*

Gas absorbers, adsorbers, thermal oxidation, direct combustion, and catalytic oxidation are defined and illustrated for gaseous emission control.

11270 APTIC NO. 28821

Industrial Gas Cleaning Inst., Inc., Rye, N. Y., Mechanical Collector Div.

EFFICIENCY VS. PARTICLE SIZE AND APPROXIMATE COST INFORMATION OF MECHANICAL COLLECTORS. *Ind. Gas Cleaning Inst. Pub., no. M-1, 3p., 1968.*

The efficiency range of mechanical collectors is outlined according to particle sizes of fly ash, non-metallic minerals, and steel. Represented are cement processes, asphalt production, clay and kiln products, fertilizer processes, foundries, incinerator products, coal processing, and general industrial applications. Approximate cost information is included.

11271 APTIC NO. 28837

Silverman, Leslie

CONTROL OF NEIGHBORHOOD CONTAMINATION NEAR BERYLLIUM-USING PLANTS. *A.M.A. Arch. Ind. Health, 19(2):254-262, Feb. 1959. 13 refs.*

The major steps to be considered in selecting a site for beryllium- using plants so as to control neighborhood contamination are presented. Site selection should include meteorological, topographical, and population data. The permissible hourly emission should be calculated on the basis of not more than 0.01 microgram/cu m at the nearest habitation under unfavorable wind and inversion conditions. Total emissions anticipated pessimistically from each operation and cleaner type selected should be determined. Stack height should be calculated on the basis of final emissions, stack air temperature, and meteorological factors. Threshold limits are mentioned as design factors. The production and fabrication of beryllium are discussed, as well as methods of neighborhood contamination control. Equipment selection is indicated, and the performance of various air cleaning devices on beryllium effluents is summarized. Costs are indicated for the selection of a final collector and cleaning apparatus. (Author conclusions modified)

11272 APTIC NO. 28839

Epstein, Arthur

PROBLEMS IN THE SAFE OPERATION OF CERTAIN BERYLLIUM-USING PROCESSES. *A.M.A. Arch. Ind. Health, 19(2):225-230, Feb. 1959.*

At a refining plant, such as the one at Hazleton, Pa., where beryl ore is taken down to nuclear grade beryllium metal, several problems must be solved. Workers must be supplied with clean clothing, and contaminated clothing must be washed. Exhaust ventilation systems must keep the air at the maximum accumlation concentration level for dust particles, and, to maintain this condition, air sampling must be carried out routinely. The problem of clothing has been dealt with by suppling all of the production people with a complete daily change of clothing which includes shoes, socks, briefs, undershirts, coveralls, and caps. Collectors are utilized in the production areas where ventilation and dust collection are of major importance. Some of the mist and gas-producing operations are exhausted to the wet-cell collecto as well. Ductwork arrangement and carrying velocities are considered for the comparatively light beryllium compounds. Hi-Vol sampling units are employed to test the effectiveness of the ventilation system.

11273 **APTIC NO. 28840**

Griwatz, G. H. and S. J. Rodgers

MOISTURE SEPARATOR DEVELOPMENT. (FIRST QUARTERLY PROGRESS REPORT). Mine Safety Appliances Research Corp., Evans City, Pa., AEC Contract AT(45-1)-2145, 5p., Aug. 1969.

NTIS: MSAR-69-151

An extensive literature survey was begun pertaining to moisture separators, droplets in the 1-10 micron range, and particle size measurements. A survey of the moisture separator market was conducted by contacting manufacturers, while a test procedure is being designed for determining moisture separator efficiencies. Preliminary work on particle size measurement and small particle generation has been initiated. A Casella cascade impactor using stained glass discs as collection plates has been examined as a potential method of sampling and particle size estimation.

11274 **APTIC NO. 28841**

Griwatz, G. H. and S. J. Rodgers

MOISTURE SEPARATOR DEVELOPMENT. (THIRD QUARTERLY PROGRESS REPORT). Mine Safety Appliances Research Corp., Evans City, Pa., AEC Contract AT(45-1)-2145, 6p., Jan. 1970.

NTIS: MSAR-70-17

Over 100 different references were gathered from the literature to evaluate the theories governing moisture elimination, with particular attention being directed to 1-10 micron mist removal. Aerosols, droplets, filters, light scattering, particle size determination, and related topics were investigated. Cascade impaction appeared to offer the most feasible approach to measuring particle size. A product survey was made to determine which moisture separators were fully developed and commercially available, and a basic outline was developed for the preliminary test plan which encompasses testing separator performance over a wide range of operating conditions. Evaluation and testing were conducted for a Royco particle size analyzer model 200 PC, a Spraying Systems nozzle No. 1-A, a Cassella cascade impactor, and the Lundgren Impactor. Efficiency versus particle size, flow rate, loading and pressure drop, was determined, as well as cleanability, airshock resistance versus loading, flooding, and corrosion resistance.

11275 **APTIC NO. 28842**

Griwatz, G. H. and S. J. Rodgers

MOISTURE SEPARATOR DEVELOPMENT. (FOURTH QUARTERLY PROGRESS REPORT). *Mine Safety Appliances Research Corp., Evans City, Pa., AEC Contract AT(45-1)-2145, 5p., April 1970.*

NTIS: MSAR-70-79

A literature survey and a product survey were completed concerning moisture separators. Development of a liquid droplet measurement technique was undertaken. Tests with a methylene blue aerosol disseminated from a spinning disc generator demonstrated the feasibility of the Lundgren Impactor at ambient temperatures. Efficiency of the moisture separator versus particle size, flow rate, loading and pressure drop, was determined, as well as cleanability, flooding, and corrosion resistance. Prototypes are being evaluated, as well as materials capable of removing fine mists.

11276 **APTIC NO. 28857**

Kaufman, J. G. and E. T. Wanderer

ALUMINUM FOR CRYOGENIC APPLICATIONS. *Mach. Des., 37(30):199-205, Nov. 11, 1965.*

Aluminum alloys are used both for structural components of space vehicles and for cryogenic processing and storage equipment. They have no ductile-to-brittle transition; hence, no appreciable loss in ductility at low temperatures. Furthermore, these alloys have high strength-to-weight ratios, are available in all product forms, have good fabricability, and are economically competitive, particularly when maintenance costs are included in over-all comparisons. Like that of most metals, the strength of aluminum alloys, under static or repeated loading, in tension, compression, or shear, increases with decrease in temperature. Aluminum alloys can be grouped into two general types with respect to strengthening methods: those that can be strengthened by cold working (rolling, stretching, forming); and those that can be strengthened by solutio heat treatment and precipitation hardening. Welding, the most common means of joining aluminum alloys in cryogenic applications, involves sufficient heat to reduce the additional strength gained b cold working or solution heat treating in the region adjacent to the weld. Typical tensile properties of various aluminum alloys at cryogenic temperatures are listed, as well as the alloys and their applications. Of the alloys most used for cryogenic applications, 1100, 3003, 6061, and the 5000 series alloys are available in most mill forms and are usually stocked in warehouses. The formability of aluminum alloys, their compatibility with cryogens, joining techniques, and their toughness are reviewed.

11277 **APTIC NO. 28858**

Cairns, E. J., E. C. Gay, V. M. Kolba, M. L. Kyle, A. D. Tevebaugh, and L. E. Trevorrow

LITHIUM/SELENIUM SECONDARY CELLS FOR COMPONENTS IN ELECTRIC VEHICULAR-PROPULSION GENERATING SYSTEMS. (FIRST REPORT). *Argonne National Lab., Ill., Chemical Engineering Div., Contract W-31-109- Eng-38, Proj. MERDC 175-69, Task IT662705A012/02/042, 19p., April 1970. 4 refs.*

NTIS: ANL-7663

Eight lithium/selenium cells with 7.5-cm-diam paste electrolyte (44.2 sq cm total area, 31.6 sq cm active area) were designed, fabricated, and tested for use as components in electric vehicular propulsion generating systems. Short-time peak-power densities up to 2 W/sq cm were delivered by these cells, and up to 60% of the theoretical capacity density was achieved (at 0.15 A/sq cm). Cell lives of 50 hr (10 cycles) have been demonstrated. Lack of wetting of paste electrolyte by lithium in some cells has resulted in high internal resistance and correspondingly poor electrical performance Vapor deposition of lithium on the paste before assembly of the cel may alleviate this wetting problem. Initial measurements of paste- electrolyte resistivities indicate that resistivity ratios as low as 3 may be achievable. Materials stability and corrosion tests have shown that a few high-temperature polymers are stable at 375 C but are not resistant to lithium at that temperature. Several ceramic materials, which could serve either as fillers or electroni insulators, are resistant to lithium at 375 C. The metals most resistant to lithium-selenium mixtures at this temperature are beryllium, niobium, Nb-1% zirconium, and chromium. (Author abstrac

11278 APTIC NO. 28860

Musser, G. S., J. A. Wilson, R. G. Hyland, and H. A. Ashby

EFFECTIVENESS OF EXHAUST GAS RECIRCULATION WITH EXTENDED USE. *Preprint, Society of Automotive Engineers, Inc., New York, 32p., 1971. 5 refs. (Presented at the Automotive Engineering Congress, Detroit, Mich., Jan. 11-15, 1971, Paper 710013.)*

A program was conducted to study the long-term operability and effectiveness of exhaust gas recirculation (EGR) as part of the complete emission control system and its effect on engine durabilit Basically, the recycle gas is taken from the exhaust system immediately before the muffler and introduced into the carburetor just above the throttle plates. Introducing the exhaust gas above the throttle plate results in a relatively constant ratio of recirculated exhaust gas to carburetor inlet air. Recirculation is turned off below about 20 mph cruise and on deceleration; since throttle position is used for control, exhaust gas recirculation is present under all acceleration modes. The amount of recirculation was established by the amount needed to give an initial oxides of nitrogen level below 750 ppm or by the maximum recirculation with acceptable driveability. During the 52,000 test miles, engine wear and cleanliness were normal with exhaust gas recirculation; vehicle performance with EGR did not decay. However, the throttle area and exhaust valves were found to be sensitive to leaded fuels. An observed higher than normal standard deviation of hydrocarbon emissions was probably due to either highly transient exhaust valve leakage or highly transient spark plug bridging. Compatible with air injection and engine modification systems for HC and carbon monoxide control, EGR effectively reduced the NOx levels with no decrease in reduction over the 52,000 miles.

11279 APTIC NO. 28865

Allen, R. R. and C. G. Gerhold

CATALYTIC CONVERTERS FOR NEW AND CURRENT (USED) VEHICLES. *Preprint Air Pollution Control Assoc., Los Angeles, Calif., West Coast Section, 45p., 1970. 8 refs. (Presented at the Air Pollution Control Association, West Coast Section, Technical Meeting, 5th, San Francisco, Calif., Oct. 8-9, 1970.)*

In the last decade, Universal Oil Products has invested more than $10,000,000 in research and development directed specifically toward the problems of reducing air pollution produced by automobiles. This program has resulted in the development of a number of practical catalytic exhaust converter devices and suitabl catalysts to be used with them. Converters are part of the total vehicle system, however, and each of several parts must be in harmony with the whole to achieve optimum results. The three principal components from the point of view of exhaust emission control are: the UOP catalytic converter with three-component control catalyst, the engine mixture ratio adjusted to an air-fuel ratio centered around stoichiometry, and unleaded gasoline. UOP's catalytic converter reduces the oxides of nitrogen and oxidizes the hydrocarbons and carbon monoxide into water and carbon dioxide in a single unit. Lead removal in and of itself lowers hydrocarbon emissions by 20-50 ppm, and decreases pollution-causing cylinder deposits by approximately 70%. Other advantages are cited, and costs are discussed. The Cost Effectiveness Index for the UOP system is shown to be -$.046 per vehicle over ten years for each equivalent reactive ton of pollutants removed per day.

11280 APTIC NO. 28867

Davis, Rogers F. and John C. Holtz

EXHAUST GASES FROM DIESEL ENGINES. *Probl. Contr. Air Pollution; Proc. 1st Intern. Congr., New York, 1955, p.74-94. 14 refs. (Marc 1-2.)*

When diesel engines are operated underground or in confined spaces, ventilation should be provided to keep harmful constituents at a safe concentration and to keep the concentration of oxygen greater than 20.5% by volume. Exhaust gases from a diesel engine consist chiefly of carbon dioxide, water vapor, oxygen, and nitrogen, while their concentration is chiefly related to fuel:air ratio. Aldehydes are objectionable because of their odor and smoke because it pollutes the atmosphere. Carbon monoxide, aldehydes, and oxides of nitrogen, which are present in small concentrations, are affecte to some extent by factors other than fuel:air ratio. Aldehydes can be removed from diesel exhaust gas by scrubbing with sodium sulfite solution inhibited with hydroquinone. Similar scrubbing tests with ferrous sulfate solutions removed about 50% of the oxides of nitrogen in small-scale tests with a CFR engine. The maximum fuel injection rate should be reduced in proportion to the change in barometric pressure to prevent the maximum fuel:air ratio from exceeding the normal operating range and causing an increase in carbon monoxide or objectionable smoke. (Author conclusions modified)

11281 APTIC NO. 28872

Schummer, Helmut and Walter Steinbauer

VOLTAGE CONVERTING PLANTS FOR ELECTROSTATIC PRECIPITATORS. *Siemens Rev., 34(12):458-463, Dec. 1967. 8 refs.*

To obtain a high degree of precipitation with electrostatic precipitators, the control system must keep the voltage as close as possible to the flashover limit. Any arcs occurring must be reliably quenched, and a direct current voltage as high as possible with little ripple should be aimed at for the precipitator. Three- phase bridge connection would be a good solution here, since the ripple of the voltage and thus also that of the precipitator curren is slight compared to other circuit arrangements. Selenium rectifiers have proved eminently suitable for electrostatic precipitator operation, and silicon rectifiers from 40 kVA upwards have also come very much to the fore recently because of their economic efficiency and compactness. Variable-ratio transformers and magnetic amplifiers used in conjunction with automatic control equipment have become a kind of standard equipment for the precipitators. However, development of thyristors has opened up ne paths for the control of power supplies. These components permit power concentration in a minimum of space, require no maintenance, and have an almost unlimited service life. A thyristor operates as a voltage controlling element analogously to a variable transformer Control is effected, however, by phase-angle rather than amplitude control.

11282 APTIC NO. 28874

THE TREND TOWARD HIGH CHIMNEYS RELIES ON THE TECHNIQUE OF INSULATIO TO ENSURE EFFECTIVENESS AND SAFETY. *(La tendence au cheminees hautes compte sur les techniques d'isolation pour assurer l'efficacite et la securite). Text in French. Chalevr et Climats, (Waterloo), 34(406):125-128, Oct. 1969.*

A 150 m tall chimney was built for a refinery which turns out petroleum products at the rate of over 750,000 barrels per day. Th chimney takes care of the waste gases emanating from the refinery, the sulfur plant, the hydrogen unit, and the steam generating system. The waste gases contain carbohydrates, sulfur dioxide, and water vapor. They enter the bottom of the chimney through three inlet ducts. The throughput of waste gases is about 1,350,000 cu m per hour at an entrance temperature at the bottom of the chimney of 375 C, with a temperature drop of 16 C between bottom and top. The insulating material must be incombustible and resistant to the wast gases, to ensure that no cracks occur which would allow corrosive gases to pass through to the outer chimney concrete structure. A cellular glass was selected as insulating material. The chimney wall, proceeding radially from outside to inside, is composed of reinforced concrete, hydrasphalte, glass insulation, an empty space of 1 cm, and an internal lining of refractory bricks. The construction provides for 11 expansion joints for lateral heat expansion. The total weight of the chimney exceeds 6000 tons, 5000 tons of which are in the outer concrete construction.

11283 APTIC NO. 28875

Ducrot, B.

MEANS FOR FIGHTING ATMOSPHERIC POLLUTION. *(Les moyens de lutte contre la pollution atmospherique). Text in French. A.P.A.V.E. Rev. Tech. (Paris), 51(170):63-69, April-May-June 1970. 2 refs.*

A systematic approach for fighting air pollution by sub-dividing the task into four groups is suggested. In the liquid fuels, sulfu is the most objectionable component. During combustion it forms th anhydrides, sulfur dioxide and sulfur trioxide. Sulfur trioxide at temperatures below the dew point, will combine with water vapor form a sulfuric acid condensate which is contained in soot and fumes. Neutralization of this acid can be effected by injecting magnesia into the combustion chamber near the burners, resulting in the formation of magnesium sulfate. Improper servicing of heater controls can account for flue gas emissions containing carbon oxide hydrocarbons, fumes, and dust. Industrial dust removal is accomplished by multi-cyclone systems, filtration, and by hydraulic electrical, and ultrasonic methods. In combatting pollution from automobile exhausts, purification by catalytic combustion is one technique now being studied. The location of new industrial plant construction requires official approval in most countries, as a means to curb pollution in inhabited areas. Well-informed citizens will more readily cooperate in fighting air pollution, even if new methods have to be paid for in part by the public.

11284 APTIC NO. 28877

Cadiergues R. and D. Thin

VENTILATION OF UNDERGROUND GARAGES AND ROAD TUNNELS. *(La ventilati des garages souterrains et des tunnels routiers). Text in French. Ind. Therm. Aeraul. (Paris), no. 697:515-520, Oct. 1969. 4 refs.*

The ventilation requirements for garages and road tunnels are determined by the amounts of fresh air volume needed for keeping th carbon monoxide content in the air within an acceptable range. The physiological effect of inhaled CO is the formation of carboxyhemoglobin in the blood. Based on average conditions relating to French cars, the emission of CO per car amounts to abou 10 liters per minute when idling, and goes up to 25 liters per minute at 80 km per hour. Based on 100 ppm CO as an acceptable maximum, the recommended rate of fresh air supply in the undergroun garage of an apartment house is 1000 cu m per hour. For public garages, 1000 cu m per hour of fresh air per parking place is suggested for fast turnover, down to 200 cu m for slow rotation. The suggested ventilation air speed is 8-10 m/sec. The air requirement for tunnels based on 100 ppm of CO when 25 cars at a time are assumed to be inside a 1-km. single lane tunnel is 3.8 cu m/sec per car. Up to a tunnel length of 1000 m, longtudinal ventilation is sufficient, using acceleration fans mounted on the tunnel roof at 50-m intervals. Longer tunnels require transverse ventilation. The suggested air speed is 6-8 m/sec.

11285 APTIC NO. 28878

THE DEVELOPMENT OF PROCESSES IN THE FIGHT AGAINST POLLUTION OF AIR BY SULFUROUS GASES. *(L'evolution des procedes de la lutte contre la pollution de l'atmosphere par la gas sulfureux). Text in French. Ind. Chim., 57(634):117-119, May 1970.*

The use of high chimneys is one expedient for keeping high sulfur dioxide concentrations from reaching ground level, but this does not represent a final answer to the pollution problem. Several processes have been investigated in recent years aimed at greatly reducing the sulfur content in fuels before they are burned, or at purifying the flue gases from high-sulfur fuels. The residual hydrodesulfurization process is mentioned. Based on the use of a new type of catalyst, the system permits the processing of crude oi containing up to 4% sulfur, and produces fuels with about 1% sulfur content. A considerable number of methods developed for treatment of flue gases are now in various stages of testing and utilization. These include converting sulfurous-anhydride to ammonium sulfate, injecting pulverized limestone, washing flue gase after injection of calcium carbonate, utilization of a sulfite as a absorbent for sulfurous anhydrides, absorption of sulfur oxides by alkaline aluminum, and oxidization of the sulfur gases by using vanadium pentoxide as a catalyst, thereby obtaining sulfuric acid as a by-product in 70% concentration.

11286 APTIC NO. 28880

COLLECTION AND REMOVAL OF FUMES AND DUST FROM A 30 TON ELECTRIC ARC STEEL FURNACE. *(Captage et depoussierage des fumees d'un four a arc d'acierie de 30 t). Text in French. J. Four Elec. Ind. Electrochim. (Paris), 74(10):259-261, Dec. 1969.*

A system for the collection and disposal of dust-carrying fumes was built and installed in a Belgian steel plant in conjunction with a 30-ton electric furnace. The 1700 C fumes are extracted by fans from inside the furnace directly into a long pipeline. The rate of extraction is automatically controlled depending on the pressure in the furnace. In the pipeline, complete combustion of the carbon monoxide gases takes place, and the fumes are cooled to 130 C by th surrounding air, and then pushed into a chamber containing a series of polyester tissue filters, which retain and collect the iron oxid dust and other particles. The purified gases are released to the atmosphere. The filters are cleaned periodically by a counter air stream. The quantity of gas collected amounts to about 350 kg per 30-ton furnace charge, producing 150 to 200 tons per year of iron oxide powder.

11287 APTIC NO. 28883

Tanaka, K., T. Sakabe, Misao Kawai, and Masaaki Oya

STUDIES ON REMOVAL OF SULFUR OXIDES FROM FLUE GAS BY DRY LIMESTONE PROCESS. *11p., 1969. 4 refs. Translated from Japanese. Belov and Associates, Denver, Colo., 20p., May 4, 1970.*

Atmospheric pollution from factories burning crude oil of high sulfur content is a serious public problem in Japan. Two experiments were conducted with the limestone injection method. On was in a fixed-bed bench scale unit; the other was a particle injection text. For the fixed bench experiment, an electric muffle type oven was used, and 1 to 2 mm particles were each fired at 800, 900, 1000, 1100, and 1200 C for three hours. The percentage of SO2 removed for each temperature is tabulated. The density increased a 1100 and 1200 C. At 1100 C, decreased absorption rate was noted. In order to determine the effect of the reaction temperature on the SO2 removal percentage, the chemical burned at 1000 C was used, wit a reaction temperature of 300-1100 C. Analysis showed the most appropriate reaction temperature to be 900 C. Four types of absorbents (powder, tablets of limestone 100-200 mesh, limestone under 200 mesh, and tablets of slaked lime) were used to investigat the effect of particle size on SO2 removal. As the diameter of the particles was decreased, the SO2 removal rate became higher. If the limestone was injected into the furnace within 1000-1100 C and the reaction was maintained between 800-1000 C, a high rate of sulf removal was achieved. For the particle injection test, a test furnace was used which included a combustion chamber, first cooler, reaction chamber, and second cooler. Standard sulfur light fuel oil was mixed with di-tertiary butyl di-sulfide at a 10:1 ratio. The absorbents were chemical-grade slaked lime, precipitated calciu carbonate, and chichibu limestone in three size-grades. Test results are given.

11288 APTIC NO. 28889

Allmendinger, D. F., V. L. Miller, and Folke Johnson

THE CONTROL OF FLUORINE SCORCH OF GLADIOLUS WITH FOLIAR DUSTS AND SPRAYS. *Proc. Am. Soc. Hort. Sci., vol. 56:427-432, 1950. 6 refs.*

Data are presented from experiments conducted to control the scorch of galdiolus with foliar dusts and sprays. In 1948 the treatments consisted of a weekly spray of lime, dusts of lime at one-, two-, and three-week intervals, lime dust at one-week intervals with re-application after rains, and an untreated check. In addition to an unsprayed control, the 1949 treatments included the following materials applied at two-week intervals: lime spray, sugar-lime spray, magnesium silicate spray and dust, calcium silicate spray and dust, and dusts of lime, talc, and soil. Lime and sugar-lime sprays were applied at four-week intervals. Of the materials used, lime was the most effective in controlling scorch. Sprays were more effective in controlling the scorch than were dusts. Chemical analyses showed that the lime absorbed considerable quantities of fluorine, and the amount of fluorine in the plant tissue was markedly less as the effectiveness of the sprays and dusts in controlling scorch increased. (Author summary modified)

11289 APTIC NO. 28890

Schwarz, Karl and Paul Schmitz

REPORT ON LECTURE GROUP 'E' OF THE CONGRESS 'REINHALTUNG DER LUFT 1969.' Staub (English translation from German of: Staub, Reinhaltung Luft), 30(2):23-26, Feb. 1970. 9 refs.
NTIS: TT 70-50047/2

Summaries are presented of lectures on the state of the art of dust removal processes; on emission reduction in coking plants, viscose-processing plants, nonferrous smelters, steel plants; and on dust removal in oil-fired steam boiler plants. Methods are noted to be available for controlling most emission sources in coking plants. Processes for removing odorous sulfur compounds (e.g., carbon disulfide and hydrogen sulfide) emitted by viscose plants are still in the development stage. Emissions from the production of nonferrous metals are relatively small compared with other sources, but of decisive local importance. Aluminum production is now exceeding that of all other nonferrous metals, and the fluorine problem must be taken into account. Venturi scrubbers are used to control iron oxides emitted by oxygen blast converters and Siemans-Martin furnaces. Factors influencing scrubber efficiency are discussed. Heavy oil containing up to 2.8% sulfur poses a problem with respect to soot emissions. A limiting value of 60 mg dust/cu m STP appears acceptable in normal operation.

11290 APTIC NO. 28905

Bartecek, J.

DUST REMOVAL FROM THE COMBUSTION PRODUCTS IN OXYGEN INTENSIFIED OPEN HEARTH FURNACES. *Hutnik (Prague), 19(9):334-337, 1969. Translated from Czech. British Iron and Steel Industry Translation Service, London (England), 9p., May 1970.*

The measured bulk density of dust emitted from oxygen-intensified open-hearth furnaces is 1.81 tons/cu m; particles below one micron constitute 70% of this dust. At the steel plant described, this fine dust is recovered by first cooling combustion gases in stages from 800 C to 130 C and then filtering the dust in a 10-chamber baghouse with a capacity of 120,000 cu m/hr. The dust is collected and pelletized for charging into the open-hearth furnace. This dust-cleaning system is guaranteed to keep dust emissions below the legal limit of 100 mg/cu m.

11291 APTIC NO. 28918

Neal, Paul A., Robert H. Flinn, Thomas I. Edwards, Warren H. Reinhaut, J. Walter Hough, J. M. Dallavalle, Frederick H. Goldman, David W. Armstrong, Albert S. Gray, Allan L. Coleman, and B. F. Postman

MERCURIALISM AND ITS CONTROL IN THE FELT-HAT INDUSTRY. *Public Health Bull., no. 263, 132p., 1941. 57 refs.*

Fifty-nine cases of chronic mercurialism were found on medical examination of 534 hatters employed in five representative felt hat factories. Four of the twenty-one men engaged in mixing and blowing; 8 of the 34 coners; 6 of the 29 hardeners, and 33 of the 179 starters, wetters-down, and sizers were so diagnosed. Mixers and blowers were exposed to 5 mg Hg per 10 cu m of air; hardeners to 2.7; and starters, wetters-down, and sizers to 2.1 mg Hg per 10 cu m of air. In any range of exposure above 1.0 mg Hg per 100 cu m the incidence of mercurialism increased with increasing duration of employment. No cases were found among hatters exposed to less than 1.0 mg Hg per cu m of air, as measured by the Nordlander instrument. Chronic mercurialism is characterized by fine, intention tremor; psychic irritability of an exaggerated degree; dermographia, excessive perspiration, and abnormal readiness to blush; exaggerated tendon reflexes; pallor; and certain abnormalities of the mouth. Mercurialism cases were found to excrete slightly less mercury in their urine than similarly exposed but nonaffected workers. Workers with elevated systolic blood pressure and albuminuria tended to excrete less mercury in their urine than similarly exposed workers who were normal in these respects. The most direct means of preventing the occurrence of mercurialism among hatters is to substitute a nontoxic carroting agent for mercury. Until this is practicable, control of the mercury hazard depends on coordinated general and local exhaust ventilation so arranged and maintained as to prevent the escape of mercury into the breathing zone of workers, and upon enclosure or segregation of fur storage rooms, blowers, driers, and other sources of volatile mercury.

Sketches of hoods and other enclosures, and specifications for air flow are presented. Methods for quantitative chemical analysis of the mercury content of air, fur, tank water, etc., and for the quantitative spectrographic analysis of mercury in urine are described in detail. (Author abstract)

11292 APTIC NO. 28921

Griwatz, G. H. and S. J. Rodgers

MOISTURE SEPARATOR DEVELOPMENT. (SECOND QUARTERLY PROGRESS REPORT). *Mine Safety Appliances Research Corp., Evans City, Pa., AEC Contract AT(45-1)-2145, 8p., Oct. 1969.*

NTIS: MSAR-69-192

The literature was searched for references providing the most practical assistance in designing, operating, and evaluating a moisture separator. Several studies were made using a steam and air mixture to evaluate moisture separators for nuclear installations, but none of these studies were confined to the 1-10 micron droplet size range reputed to present the greatest problem in removal and causing damage to HEPA Filters. Droplet size measurements by light scattering, photographic and electrical methods were considered for in situ techniques. However, the most promising technique for particle size measurement appears to involve the use of an impactor device. Companies were contacted, but only about 12 firms out of the 115 notified agreed to supply separators at specified conditions. Development of a droplet size measuring technique is to be undertaken, as well as a test system designed to provide reasonable assurance of performance and efficiency. This would include efficiency versus particle size, flow rate, loading and pressure drop, as well as cleanability, air-shock resistance versus loading, flooding and corrosion resistance.

11293 APTIC NO. 28928

Lovering, P. E.

GAS ABSORBENTS FOR BREATHING APPARATUS AND RESPIRATORS. *In: Gas Purification Processes. G. Nonhebel (ed.), London. George Newnes Ltd., 1964, Chapt. 17, Part B, p. 789-799. 10 refs.*

The versatility of the canister respirator, which provides protection against low but highly toxic concentrations of almost any poisonous gas, vapor, particulate smoke, or dust likely to occu in a factory atmosphere, leads users to over-estimate its capabilities and overlook its limitations. These respirators should not be used if the gas concentration may exceed 1% by volume or if there is a possibility of a shortage of oxygen in the atmosphere. The two main groups of absorptive materials are adsorbents, in which the ultramicroscopic capillaries physically hold the toxic gas or vapor, and chemical absorbents, with which the toxic material reacts, producing a stable nonvolatile compound held in the absorbent bed. In the special case of carbon monoxide, the usual practice is to catalytically oxidize CO to carbon dioxide. The composition and efficiency of each of these groups of absorptive materials are discussed. The common defect of catalysts for CO is susceptibility to poisoning by water vapor, always present in the air to some extent. Various devices are mentioned which indicate the approaching failure of the catalyst.

11294 APTIC NO. 28929

Way, N. R.

AIR PURIFICATION FOR BUILDINGS. *In: Gas Purification Processes. G. Nonhebel (ed.), London, George Newnes Ltd., 1964, Chapt. 17, Part A, p. 760-789. 8 refs.*

Air purification for assembly halls and offices is discussed. Particles between 1 and 10 microns cause the principal health hazard. The characteristics of dry and viscous filters are discussed, and a graph is shown of the general relation between the efficiency and dust loading features of the various types. Design criteria for a filter plant and for the choice of suitable filter media are given, and plant costs are considered. A typical layout of a filter installation and necessary precautions to be taken are presented. Initial and routine checks are recommended, and methods for diagnosing and remedying troubles in operation are explained. Air purification for factories where absence of dust is essential is also discussed. The production of such clean air is not easy an to obtain and maintain near absolute filtration of the air requires careful installation and operation. Filters must have very fine fibers. Installation design must include precautions to prevent contamination carried into the room by personnel or materials. A typical clean-room layout and directions for installation and operation of the plant are given. Routine checks of the workroom air should be made. When sterile conditions are necessary, the filters recommended for clean-room use are highly efficient against bacteria. Sampling techniques can be adapted and determinations of the efficiency of the installation can be made by cultivation of the bacteria in the samples.

11295 APTIC NO. 28930

Nonhebel, G.

PURIFICATION OF THE ATMOSPHERE IN NUCLEAR-POWERED SUBMARINES. *In: Gas Purification Processes. G. Nonhebel (ed.), London, George Newnes Ltd., 1964, Chapt. 17, Part C, p. 799-809. 1 ref.*

The sources and composition of impurities in submarine atmospheres are discussed, and both the highest concentrations normally found and maximum acceptable concentrations are tabulated. A diagram of possible arrangement of the component parts of an air purification train is shown. The production of carbon dioxide from a crew of 120 men is 90 cu ft/h, requiring a removal system employing regenerable solutions or solids with the expulsion of regenerated CO2 to sea. The relative advantages of monoethanolamine, alkazid, and solid regenerable absorbents are discussed. A dual system for carbon dioxide removal and oxygen generation is illustrated, but it is not known whether an operational design is satisfactory in service. The catalytic combustion system developed has a capacity of 250 cu ft/min. It operates within the range 600-650 F, using Hopcalite, is a co-precipitated mixture of equal amounts of oxides of manganese and copper, as a catalyst. Below 250 F, Hopcalite is affected by water vapor and is poisoned by hydrocarbons. Its use at elevated temperatures is a new development. Specifications are given for the high duty electrostatic precipitators which are required to keep the aerosol concentration below 0.1 microgram/lite

11296 APTIC NO. 28931

Hoftyzer, P. J.

ABSORPTION OF NITROUS GASES. *In: Gas Purification Processes. G. Nonhebel (ed.), London, George Newnes Ltd., 1964, Chapt. 5, Part B, p. 186-218. 78 refs.*

Factors affecting the degree to which the absoorption rate is increased are discussed. The absorption of nitrous gases is illustrated by the absorption of nitrogen peroxide for the production of nitric acid. The absorption of nitrous gases produced by the catalytic oxidation of ammonia is discussed, including the following factors: composition of the nitrous gas mixture; reaction equations; equilibria; the mechanism of nitrogen dioxide and nitrogen tetroxide absorption; simultaneous absorption of nitric oxide and nitrogen dioxide; favorable conditions for the absorption of nitrogen oxides; and the oxidation of nitric oxide. The discussion of absorption equipment includes the requirements which the system must satisfy, a diagram of a general flow sheet, types of absorption towers used, and types of packed towers, which are used most frequently for nitric acid production in Europe. The proper choice of materials for the construction of a nitric acid producing plant is analyzed. Methods of operation are also discussed.

11297 APTIC NO. 28932

Jackson, J.

GAS ABSORPTION TOWERS. *In: Gas Purification Processes. G. Nonhebel (ed.), London, George Newnes Ltd., 1964, Chapt. 5, Part A, p. 121-186.*

Absorption towers should be designed to increase either turbulence, surface area, or both. The packed tower has been the type most generally used. Plate towers, mainly used for distillation purposes, also are used. Types of plates and new types of packing are discussed. The choice between packed or plate towers depends on the corrosive character of the substances being handled; with corrosive substances the packed tower is superior since only the tower shell must be made of expensive corrosion-resistant materials The essential design features of a packed tower are the area of cross-section and the height of packing required. The selection of the gas rate at the loading point determines the area of cross section of the towers. Selection is usually based on consideration of loading point, but may be worked out on an economic basis to fin gas rates which give minimum total annual charges for the tower. The coefficient method of determining the height of packing require is explained. The transfer unit method is used to give a rapid approximate estimate of the height of packing required, or as a substitute design method instead of the coefficient method, or to predict the absorption efficiency of the tower. For plate towers, the essential design features are the area of cross-section and the height of the tower, but these are determined in different ways. The number of theoretical plates must be determined, and the plate efficiency found, so that the number of real plates required can be calculated. Practical aspects of the construction and operation of absorption towers such as instrumentation and liquid distributor and redistributors are examined. Safety hazards and precautions are suggested. Problems of vent scrubbers and effluent disposal are discussed.

11298 APTIC NO. 28944

Fitch, R. E. and J. D. Kilgroe

INVESTIGATION OF A SUBSTITUTE FUEL TO CONTROL AUTOMOTIVE AIR POLLUTION. (FINAL REPORT). *Consolidated Engineering Technology Corp., Mountain View, Calif., Contract CPA 22-69-70, CETEC 01800-FR 69p., Feb. 1970. 8 refs.*

NTIS: PB 194 688

A study was conducted to investigate the feasibility of using methanol as a substitute fuel for gasoline to reduce exhaust pollutants emitted from automotive engines. Automotive engine tests of a car fueled first on gasoline and then methanol were conducted to obtain comparative exhaust emission and vehicle drivability data. Laboratory tests were structured to investigate the effects of engine parameters upon performance and exhaust emissions. Parameters included compression ratio, air-to-fuel ratio, percent of liquid fuel dissociation, fuel-air mixture, engine inlet temperature, and spark timing. Methanol was shown to be a satisfactory fuel from the standpoint of engine operation, but vehicle mileage was low. While methanol emissions as low as 1900 ppm were produced, suspected high aldehyde emissions were confirmed However, it is believed that optimization of the fuel-air ratio, the mixture distribution to the cylinders, and heating of the fuel-air mixture, will result in improved performance and substantially reduced emissions, except for oxides of nitrogen. Laboratory engine operation with blends of reform gases and methano was shown to be successful in improving engine performance and providing major reductions in methanol and formaldehyde emissions.

11299 APTIC NO. 28957

Semrau, Konrad T.

FEASIBILITY STUDY OF NEW SULFUR OXIDE CONTROL PROCESSES FOR APPLICATION TO SMELTERS AND POWER PLANTS. PART III: THE MONSANTO CAT-OX PROCESS FOR APPLICATION TO POWER PLANT FLUE GASES. (FINAL REPORT). *Stanford Research Inst., Menlo Park, Calif., NAPCA Contract CPA 22-69-78, SRI Proj. PMU-7923, 69p., 1969(?). 20 refs.*

NTIS: PB 197168

The Monsanto Cat-Ox system for sulfur oxides recovery is essentially an adaptation of the contact process for sulfuric acid manufacture. Gas containing both sulfur dioxide and oxygen is passed through a fixed bed catalyst at an appropriate temperature and most of the sulfur dioxide is oxidized to sulfur trioxide. The gas is then passed through an absorption tower where the SO3 is absorbed in recirculated sulfuric acid. The system was developed for use on gas (primarily power plant flue gases) containing dilute SO2 concentrations – typically 0.1 to 0.4%. Process data and cost estimates are presented for two variations of the Cat-Ox system: an integrated system to be constructed as part of a new power plant and a system to be added to an existing power plant. In addition, the system is evaluated in terms of dust collection, acid mist formation and collection, and corrosion.

11300 APTIC NO. 28963

Semrau, Konrad T.

FEASIBILITY STUDY OF NEW SULFUR OXIDE CONTROL PROCESSES FOR APPLICATION TO SMELTERS AND POWER PLANTS. PART II: THE WELLMAN-LORD SO2 RECOVERY PROCESS FOR APPLICATION TO SMELTER GASES. (FINAL REPORT). *Stanford Research Inst., Menlo Park, Calif., NAPCA Contract CPA 22-69-78, SRI Proj. PMU-7923, 90p., 1969(?). 32 refs.*

NTIS: PB 197 167

The Wellman-Lord process for recovering sulfur dioxide is a cyclic absorption-desorption process producing concentrated SO2 from waste gas streams, such as power plant flue gas and smelter offgases. It is adaptable for use with gas streams containing low or relatively high SO2 concentrations. The system uses a solution of sodium sulfite as the absorbent. In the absorption cycle, the sulfite ion reacts with the SO2 to form bisulfite. In the recovery cycle, the reaction is reversed by application of heat, releasing sulfur dioxide and regenerating the sulfite. The regeneration step is an innovation in that it reduces the amount of steam consumption from levels required by direct steam stripping of the absorbent. In smelter model studies, the Wellman-Lord process was applied conceptually in 12 control schemes producing sulfuric acid or elemental sulfur. Where sulfuric acid was to be the product, the system was applied only to gas streaming containing 2% or less SO2. Where elemental sulfur was to be the product, the process was applied to all the gas streams to concentrate the SO2 for subsequent reduction. The limiting economic factor in the application of the process proved to be the capital and operating costs of the chemical recovery section, which dominated the total costs. For all control schemes producing elemental sulfur, the cost of production exceeded by factors of two or more any reliable price that might be obtained for the sulfur. Of those control schemes producing sulfuric acid, only one attained a production cost that might be reasonably competitive; in this scheme, SO2 was concentrated from reverberatory furnace gases and fed to a conventional sulfuric acid plant operating on the roaster and converter gases.

11301 APTIC NO. 28975

GLASS BAG COLLECTOR AT UNIVERSAL ATLAS' NORTHAMPTON PLANT.

Pit Quarry, 63(8):113, 115, Feb. 1971.

Effluent from two wet process kilns in the cement division of a steel plant are collected in two bag houses, each handling 150,000 cfm. The collectors are compartmented into 12 equal sections, each with 78 glass bag filters. The system is totally automated and operates at temperatures up to 550 F. Total collection efficiency is better than 99%. Before entering the bag houses, kiln exit gases pass through cyclone collectors, where 75% of the dust particulates are collected.

11302 APTIC NO. 28978

Zarfoss, J. R.

OPERATING CHARACTERISTICS THAT INFLUENCE PRECIPITATOR 'SNOWING': AN INTERIM REPORT.

TAPPI, 54(4):546-548, April 1971. (Presented at the Water and Air Conference of the Technical Association of the Pulp and Paper Industry, Minneapolis, Minn., June 7-10, 1970.)

During a systematic study of the discharge of salt cake agglomerates, or 'snow', from recovery precipitators, every installation visited was found to emit these agglomerates. The number and size of the agglomerates varied considerably, but typical agglomerates were 0.015-0.125 in diameter. The smaller sizes were discharged continually, but regularly spaced emissions of large numbers of the larger size occurred coincidentally with rapping of the outlet field collection surfaces. Sources other than rapping were apparent; however, even if combined, they would not equal the influence of rapping the outlet field. The number and size of the agglomerates were greatly reduced by controlling gas velocity, electrostatic field strength, and rapping; but 'snowing' was never completely stopped. The evidence is that formation of agglomerates is caused by natural reaction of salt cake to an electrostatic field. There is little promise that they can be stopped from forming, but their discharge can be held to a minimum by sizing and designing precipitators in accordance with the current state of the art. (Author abstract modified)

11303 APTIC NO. 28981

Erdmannsdoerfer, Hans

CAPABILITIES OF PAPER FILTERS FOR CLEANING THE INTAKE AIR OF DIESEL ENGINES.

(Leistungsmoeglichkeiten von Papierfiltern zur Reinigung der Ansaugluft von Dieselmotoren). Text in German. Motortech. Z. (Stuttgart), 32(4):123-131, 1971. 6 refs.

Paper filters have replaced the oil-bath filters for cleaning the intake air of diesel engines. The collection efficiency of paper filters remains equally good in all load ranges. As tests with coarse and fine dusts have shown, paper filters retain more dust of all grain sizes than oil-bath filters. The collection efficiency of paper filters can be determined by three methods: the air bubble test, the mercury test, and direct determination of permeability with particles. With the first two methods, equivalent pore sizes have to be calculated with the aid of surface tension and wetting angle; the third method yields direct pore diameters. Experimental conditions influence the result, however, and must be indicated with the result. In the air bubble, test air is pressed through a paper filter wetted with a fluid. In the mercury test, the mercury penetration is determined as a function of the pressure, from which the equivalent/pore-diameter is calculated. Pore volume influences the extent of dust retention: a large pore volume means higher dust retention capacity than low pore volume for otherwise equal papers. All paper filters are impregnated with resins to render them stable against mechanical, thermal, and climatic influences.

11304 APTIC NO. 28986

Kalika, Peter W.

USE AN ENGINEERING APPROACH TO POLLUTION CONTROL.

Plant Eng., 25(6):57-59, March 1971.

An analysis is presented of the stages constituting the engineering approach to in-plant pollution problems. These stages involve defining the dimensions of the problem, setting objectives for the desirable levels of emissions, developing alternatives capable of meeting the established objectives, evaluating alternatives, and developing and putting into action an implementation plan. Finaly, the performance of the pollution control system must be continuously monitored both in terms of emissions (or equipment efficiency) and costs. The role of the plant engineer in applying the engineering approach is stressed, an the approach is illustrated by the example of a solvent-emitting plant.

11305 APTIC NO. 28987

DIRT DESTROYS.

Compressed Air, 75(11):14-15, Nov. 1970.

The three basic types of inlet filters for air compressors are discussed. The oil-bath type removes dirt by a scrubbing action. Dust is washed down and collects in a sump that must be cleaned regularly. The dry-type air cleaner has filter media made either of a felted cloth or chemically treated pleated filter paper. Viscous-impingement filters have woven or packed wire in cell frames, the whole being coated with oil to collect dirt. Oil-bath filter efficiency is about 98% at maximum rated air flow; dry type is 99.9%. The dry filter is required for nonlubricated compressors, and also functions well at air flows below maximum rating. Viscous-impingement filters are used principally under steady flow conditions, as with a dynamic or rotary compressor. They are not recommended for extremely dusty areas or nonlubricated machines.

11306 APTIC NO. 28992

Boggs, Robert N.

AIR FILTER COALESCES AND DRAINS OFF CONTAMINANTS.

Design News, 26(7):58-59, April 1971.

Air filters that function by absorbing liquid contaminants from an air stream eventually become saturated, at which point liquid migration or carryover occurs. A new high-efficiency filter overcomes the carryover problem by causing particles to be trapped on extremely fine fibers where they coalesce and agglomerate. As the drops grow larger, they move toward an outer foam jacket, which acts as a holding tank for collected liquids. A silicone binder at each end of the jacket prevents particle migration. The filter itself is a random, felted structure of borosilicate strands. The unit is rated 99.9998% effective on solid and liquid particles larger than 0.03 micron.

11307 APTIC NO. 28996

Huenigen, Edmund

REDUCTION OF THE LEVEL OF NOXIOUS COMPONENTS IN THE EXHAUST GAS OF INTERNAL COMBUSTION ENGINES BY FUEL ADDITIVES. *(Schadstoffminderung im Abgas von Verbrennungsmotoren durch Kraftstoffzusaetze). Text in German. Freiberger Forschungsh A no. 474:41-51, 1969. 11 refs.*

Additives to gasoline do not reduce the carbon monoxide and hydrocarbon emission sufficiently when compared with other measures. The problem of air pollution cannot be solved by additives to gasoline. Tests performed with an additive based on polypropylene glycol did lead to a 30-40% reduction of the CO emission level but hydrocarbon emission was unaffected. This result can however be achieved cheaper by engine adjustment and by other means. Diesel fuel additives on the other hand are promising because they do reduce the smoke plume. New regulations introduced in the German Democratic Republic in 1969 limit the emission of vehicles powered by Diesel fuel to 0.35 g soot per cu m exhaust gas. To meet this requirement additives will have to be used in Deisel fuels. If in the future 2 cylinder engines will still be of economic importance, then lubricants will have to be improved by additives to reduce the visible smoke plume. In this case the emission of noxious substances can be reduced simultaneously.

11308 APTIC NO. 28997

Meissner, Franz

THE EFFECTS OF FUEL ADDITIVES, ESPECIALLY IN DIESEL ENGINES. *(Auswirkungen von Kraftstoffzusaetzen, besonders in Dieselmotoren). Text in German. Freiberger Forschungsh A no. 474:53-66, 1969. 3 refs.*

Diesel engine fuel additives developed in the course of the last decade are reviewed including antismoke additives, engine cleaner additives, additives designed to improve the lubricating effect, anticorrosive additives and additives designed to improve the storage life of fuels. Blue smoke is caused by an inappropriate fuel-air ratio, black smoke by cracking. The blue smoke emission period can be shortened when a fuel with a high cetane number is used and by the addition of isopropyl nitrate or cyclohexanol nitrate. Soot formation in Diesel engines is a multifactorial phenomenon which can be reduced by the addition of barium additives which reduce the glow point of carbon heated in air. Residues of incomplete engine combustion can be reduced by the additive Autol-Desolite whose effectiveness is due to its fatty acid and fatty acid ester content. This additive also reduces the CO content in the exhaust gas by almost 50% depending on load. The lubricating properties of Diesel fuel can be enhanced by additives containing molybdene bisulfite, fatty acids, metalloorganic and other compounds. Anticorrosives blocking corrosion of reactive surface areas contain dicarbonic acids, polymerized linseed oil acids, tricresyl orthophosphate and non symmetrical dimethylhydrazine. The storage life of Diesel fuels can be prolonged by preventing the precipitation of resin, gum and dirt by additives containing aniline dimethylhydrazine, hydroquinone and other compounds. Antiknock additives are reviewed.

11309 APTIC NO. 28999

Gloger, J. and W. Jugel

THE EFFECT OF GEOMETRIC PARAMETERS AND OF THE CRUDE GAS DUST CONTENT ON THE SEPARATION EFFICIENCY AND PRESSURE LOSS OF CYCLONE SEPARATORS. *(Einfluss der geometrischen Parameter und der Rohgasstaubbeladung auf Abscheidegrad und Druckverlust von Zyklonabscheidern). Text in German. Maschinenbautechnik, 20(3): 156-161, March 1971. 15 refs.*

The relationship between separation efficiency and pressure loss is essentially expressed by the Barth equations. These equations are based on simplified assumptions, they do not consider crude gas dust content and dust agglomeration and thus the relationship is only an approximation. In Barth's theory the cyclone cone height plays an important role: separation efficiency increases with increasing cone height. The same effect can also be achieved by shortening the immersion tube depth while the cyclone cone height remains constant. While theoretically this should lead to improved separation efficiency, experiments disclosed that an optimal separaion is achived when immersion tube depth is approximately 1 1/2 times its diameter. Experiments further disclosed that separation efficiency was minimal at low crude gas dust levels. Only in the case of dusts with a high coarse particle content and a high electrostatic charge (PVC) separation efficiency is very high (sometimes exceeding 99%) and a minimum cannot be perceived. Hitherto ascertained experimental data do not yet warrant an exact analysis of the effect of dust movement on separation efficiency.

11310 APTIC NO. 29004

Audibert, F. and P. Duhaut

DESULFURIZATION AND CONVERSION OF RESIDUALS BY HYDROTREATMENT. *(Desulfuration et conversion des residus par hydrotraitement). Text in French. Rev Inst. Franc. Petrole, 25(5):613-622, May 1970.*

The I.F.P. (Institut Francais du Petrole) residual/desulfurization and conversion process involves the catalytic hydrogenation of residual ils of high viscosity and high sulfur content, and of residuals with a high metal and nitrogen content and yields low sulfur content fuel oil and high quality diesel oil. A special catalyst on a support base is used which is resistant to contamination by coke and cinders from the decomposition of organometallic deposits on the external layer of the catalyst. The catalyst is regenerated at the end of each cycle by burning off the coke deposit. Sulfur is oxidized to metallic sulfates. A pretreatment before reaching the catalytic reactor changes the characteristics of the feedstock so as to improve the desulfurization of of product and lower its freezing point. The viscosity of three types of residual oil (Libya, Kuwait) was reduced from 11, 21 and 33 cSt at 210 F to 4.8-7, 5.35 -9.5 and 8.5-11.7 c St at 210 F respectively, the sulfur content from 0.85, 2.6 and 4% of weight of oil to 0.15-0.21, 0.60-0.83 and 1.2-1.5% of weight of oil respectively and the congealing point from 91.5, 78 and 64.5 F to 27-75, 21-69 and 32-42 F respectively. The manner of pretreatment, catalyst, base and reaction proper are not described.

11311 APTIC NO. 29007

Constance, John D.

CONTROL OF EXPLOSIVE OR TOXIC AIR-GAS MIXTURES. *Chem. Eng., 78(9):121-124, April 19, 1971. 6 refs.*

The risk of explosion in the handling of solvents or dangerous gases can be avoided by mixing the gases or vapors with sufficient air. Charts and forumlas are presented by means of which the air quantities needed to make gas-air mixtures explosion-proof and nontoxic can readily be found. In addition, general system-design precautions are noted, and explosive limits and maximum allowable concentrations of typical hazardous gases and vapors summarized.

11312 APTIC NO. 29008

Smith, Elbridge M.

PREVENTIVE MAINTENANCE HELPS PREVENT POLLUTION. *Pollution Eng., 3(2):19-23, March/April 1971.*

Regulatory agencies are devoting more effort to ensuring that installed pollution control equipment operates at optimum levels. Pollution engineers will have to provide records for agency inspection, proving that equipment is properly operating and performing as designed. There is also the engineer's responsibility to his company to extend equipment life and minimize maintenance costs. The requirements of a successful preventive maintenance program are outlined and design characteristics and possible operational problems are noted for the following control devices: cyclone collectors, scrubbers, baghouse filters, and electrostatic precipitators.

11313 APTIC NO. 29013

Pinheiro, George

PRECIPITATORS FOR OIL-FIRED BOILERS. *Power Eng., 75(4):52-54, Apri 1971.*

The moderate plume visibility of oil-fired boilers, which the publi ignored in the past, is now considered unacceptable. In addition, there is the problem of acidic smut from oil firing. Experience with operating electrostatic precipitator installations has shown that smut can be eliminated and emission opacity substantially reduced. The stickiness of oil ash and its low resistivity make high precipitator efficiency more difficult to achieve. Nonetheles modification of flyash precipitators for oil ash is neither extensive nor extremely costly; the major change is a new power supply, or addition to the existing power supply. Other differences are minor: additional protection of high-voltage bushings, and special provision for ash removal from the precipitator. With these modifications, particulate emissions should be under 0.01 grains/standard cu ft.

11314 APTIC NO. 29014

Papamarcos, John

FUEL OIL ADDITIVE PASSES TESTS. *Power Eng., 75(4):46-48, April 1971. 1 ref.*

Extensive tests of a new fuel oil additive were carried out on a 115,000-lb/hr boiler. The additive was a patented nitrogenous manganese complex called Rolfite 101. The sulfur trioxide level in the test boiler was about 25 ppm before fuel treatment. After 96 days of treatment, SO3 was eliminated and was virtually undetectable for the remainder of the year-long test. The additive also reduced deposit formation, cold-end corrosion of air heater tubes, smoke density (58%), and enabled the boiler to operate at lower excess air levels. In addition, all measurements made after treatment showed lower SO2 concentrations than the theoretical (e.g., 90% after 96 days and 78% after 314 days).

11315 APTIC NO. 29017

Thomas, J. W., D. Rimberg, and T. J. Miller

GRAVITY EFFECT IN AIR FILTRATION. *J. Aerosol Sci., 2(1):31-38, Feb. 1971. 6 refs.*

A gravity effect was found in the low velocity filtration of aerosols by fibrous filter media. Four types of fiberglass filters were tested with monodisperse particles in the one micron particle diameter range at air velocities of the order of 1 cm/sec. The gravity effect was demonstrated by determining aerosol penetration for both upflow and downflow. Aerosol penetration for upflow, where the flow direction is opposite to gravity, was always equal to or greater than penetration for downflow, where flow direction is with gravity. (Author abstract)

11316 APTIC NO. 29039

Holton, John T.

PORTABLE FILTER BAG HOUSES FOR MOBILE ASPHALT PLANTS. *Filtration Eng., 1(3):26-27, Nov. 1969.*

Portable filter bag houses are now available for filtering gases from the mobile asphalt batch plants being used in highway construction. In the aslphalt industry, the main problem in the filtration of air coming off the rotary dryer are condensation, heat, and filter blinding. To combat these problems, the bag houses use insulated walls, pulse-jet cleaning action, and felt bags made of heat-resistant nylon. Stack exhaust from the portable dust collectors seldom reaches, .05 grains/cu ft, which puts the equipment well within federal and state codes. An added advantage of bag houses is that 'fines' are collected on a screw conveyor.

11317 APTIC NO. 29046

Taupitz, K. -C.

EXPERIENCE WITH THE BURNING OF GRANULAR MAGNESITE, DOLOMITE AND LIME IN THE ROTARY KILN. *(Erfahrungen mit dem Brennen von stueckigem Magnesit Dolomit and Kalk im Drehrohrofen). Text in German. Zement-Kalk-Gips (Wiesbaden), 60(1):11-26, 1971. 10 refs.*

When granular magnesite, dolomite, and lime are burned in a rotary-kiln, 3 to 10% dust is produced (kiln output) and 7 to 22 g/cu m of dust are found in the waste gas. Efficient sifting of the material prior to charging helps to reduce development of the dust. Dust quantity is high when the furnace narrows conically in the calcining zone. The grain size of dolomite dust is primarily 0.08 to 0.2 mm while 90 to 95% of the lime and magnesite dusts have grain sizes of less than 0.09 mm and 30 to 40% less than 0.01 mm. Mechanical dust collection with multicyclones is not efficient enough for these dusts. Electrostatic precipitators are not very suitable either since the conductivity of lime, dolomite and magnesite dusts is low. Usually the waste gases are cleaned to a residual dust content of 200 to 300 mg/cu m. Better results are achieved when the waste gases are cooled by water injection to 130 or 150 C. The best results were achieved with wet dust collection. After mechanical cleaning in cyclones or cloth filters the gases are cooled in a scrubber to 50 or 70 C and most of the dust is removed. Afterwards the gas is subjected to fine cleaning. By this method less than 100 mg of dust remain in the gas. By recirculating the water several times the water consumption can be limited to between 300 and 600 liter/1000 cu m.

11318 APTIC NO. 29058

Yamanaka, Tatsuo

UTILIZATION OF CATALYST IN AIR POLLUTION CONTROL (3). *(Kogai boshi gijutsu ni okeru shokubai no riyo - 3). Text in Japanese. Kagaku Kogyo (Tokyo), 22(4):534-539, April 1971.*

The use of catalysts for removal of nitrogen oxides discharged from nitric acid plants and for air purification purposes and the effects of leaded gasoline on the catalysts are discussed. In connection with the use of a catalyst for removal of NOx, the following points should be given careful consideration: selection of catalyst type (pellet or honeycomb); minimization of oxygen content in gas fuel; selection of a one-stage or two-stage purification process; and desulfurization of fuel to avoid deterioration of the catalyst. The removal efficiency of NOx is higher when the temperature of gas at the exit is high. Therefore, the one-stage process is preferable in NOx only is to be removed from the emission gas. The two-stage process provided with a cooling device between the first and second stages is used when the temperature should not be very high. An example is the nitric-acid tail-gas purification system. For air purification, platinum or palladium catalysts that can function at lower temperatures are used. For removal of hydrocarbons or other organi compounds iron cobalt copper or Manganese oxide with Pt or Pd is used as the catalysts. A heat exchanger or a damper is incorporated in order to avoid lowering the temperature of the catalyst layer. The basic mechanisms of the catalyst-type air purifier are described. Experimental observations show the Pt or Pd catalyst to be adversely affected by zinc, silver, cadmium, tin, mercury, lead, or bismuth only when water content is present in liquid form, never when in gaseous form. The adverse effects were most conspicuous at low temperture ranging from 50 to 90 C. When the temperature was high, these harmful metals were neutral, producing no adverse effects on the catalyst. In an experimet in which the catalyst was kept in contact with lead at 200-300 C for 5 hours, the catalyst was unaffected. This suggests that deterioration of the catalyst used in an automobile can be prevente if the lead compound and water content are immediately driven out by air blown in before the catalyst layer cools after the engine stops.

11319 APTIC NO. 29059

Purchas, D. B. and R. M. Wells

EVALUATING THE PERFORMANCE OF FILTER MEDIA. *Filtration Separation (Purley), 8(1):47-48, 51-52, 55-56, 59-60, Jan./Feb. 1971. 22 refs. (Presented at the Institute of Chemical Engineers and Filtration Society's Symposium, London, England, March 18, 1970.)*

Few criteria have been established for the evaluation of filter performance and the correct selection of the medium. Almost all evaluation relates to media use for clarification duties, whether wet or dry. Far less has been done to develop procedures for cake filtration. Because different operating conditions and the hardware effect filter performance, no cohesive system has emerged to evaluate any filter medium. Air cleaning has received more attention and been developed to a higher degree of standardization than any other field. Tests have also been formulated for automotive oil filters, hydraulic fluid filtration, and sheet filters. Other filters, such as aircraft fuel, aircraft refueling, precoat, and cloth-covered process filters have inadequate or standard tests.

11320 APTIC NO. 29064

Hudry, L. and A. Gibault

POLLUTION CONTROL AT THE PORCHEVILLE 'B' THERMAL POWER PLANT. *(Prevention des nuisances industrielles a la centrale thermique de Porcheville 'B'). Text in French. Tech. Moderne, 63(2):53-67, Feb. 1971.*

The antipollution installations of the Porcheville thermal power plant which went into operation on July 27, 1968 have meant an added yearly cost of 20 Francs per inhabitant for water pollution control and 60 Francs for air pollution control. The measures instituted included measures against noise causd by friction, shock, vibration (mechanical), the discharge of steam, compressed air, ventilation and by vibrations of electric origin. Manufacturers of all noise generating equipment including boilers, generators, safety valves and transformers had to meet prescribed maximal noise standards. The plant is practically noiseless. Water pollution control involved measures against pollution by accidental discharge of petroleum products, purification of effluents regularly discharged into the Seine and measures against thermal pollution by water heated by the condensation of steam emitted by turbines. The plant uses fuel oil with a sulfur content between 1-2%. The daily discharge of SO2 into the atmosphere from the burning of 3000 t fuel oil amounts to 120 to 180 t. The flue gas contains between 3.4 and 5.1 g SO2/cu m and must be diluted at least 3400 times to keep pollution below a threshold of 1 mg SO2/cu m. To this end 22 m high stacks have been built and the emission norm is met.

11321 APTIC NO. 29067

GAS PURIFICATION FILTERS. *(Filtres pour l'epuration des gaz). Text in French. Tech. Moderne, 63(2):83-84, Feb. 1971.*

Industrial dust collectors manufactured by Lurgi for the purification of manufactured or of residual gases work on the principles of precipitation of dust or of fog by an electric charge in an electrofilter, of filtering the gas by a layer of gravel, of centrifugaling the dust-laden gas in a cyclone, or of washing the dust-laden gas in scrubbers. Electrofilters are the most economical of th four types of dust collectors, especially for very large gas quantities where the residual dust content must be very low. Even the finest particles are precipitated, the consumption of electricity is low and the equipment is insensitive to high gas temperatures. The construction of electrofilters can vary widely. Gravel filters using mechanical filtration through a layer of granulated material are suited for small to medium amounts of gas and for residual dust contents of about 50 mg/cu m. Cyclones work with an efficiency of between 80-98% but are not suited for the removal of fine dust particles; they are used in the mineral processing industries (cement, coal) and for the removal of droplets suspended in gases. Scrubbers for wet dust removal, especially venturi scrubbers, are used in a large scale in connection with blast furnaces, converters, electric kilns and incinerators.

11322 APTIC NO. 29073

Kohayakawa, Takashi and Hiromichi Koyama

CO % AT IDLING. *(Aidoringu no CO nitsuite). Text in Japanese. Taiki Osen Kenkyu (J. Japan Soc. Air Pollution), 5(1):251, 1970. Proceedings of the Japan Society of Air Pollutin, Annual Meeting, 11th, 1970.)*

Carbon monoxide emission during idling increases with an increase in air-fuel ratio and decreases with an increase in revolution. Spark timing and tappet clearance do not in general influence the CO emission during idling. The amount of CO decreases with a decrease in cooling fluid temperature. An increase in intake air temperature increases CO, the extent of the increase depending on the type of engine. A decrease in atmospheric pressure from 757 to 746 mm Hg increases the CO concentration from 2.4 to 3.3%. The amount of CO also depends on the 'breaking in' of the new engine. For 10 new test engines, CO increased by about 1.7% after 3000 km. The variances in the CO concentration during idling showed that ajustment of the carburetor has a large effect. Carbon monoxide emission can, therefore, be regulated by installing an idle limitor, which in most cases consists of a cap and a stopper on the air-fuel ratio controller screw. The CO concentration during idling and the CO concentration for four-mode driving had a correlation of 0.7. Limitng CO during idling tends to increase nitrogen oxides emissions, but their absolute levels are quite low and do not present a problem.

11323 APTIC NO. 29077

BAG COLLECTOR REDUCES DUST, COST AND LABOR. *Roads Streets, 113(11):78-80, Nov. 1970.*

An asphalt hotmix plant in Virginia has replaced a combination cyclone-wet washer system with a baghouse dust collection system designed to meet current and proposed Virginia codes. The new system operates without water, eliminating water make-up costs. There is no vapor plume of steam emission from the stack, and the only moisture in the stack is from the aggregate. Moreover, the dust is salvageable for mineral filler. The bghouse, which contains four compartments housing 168 fiberglass bags each, can be stopped and started at any time and is capable of going from no load to full load operating conditions with no loss of plant production.

11324 APTIC NO. 29079

Sano, Hiroshi and Tsuneo Otani

SELECTIVE TRANSMISSION MEMBRANE OF SULFURIC ACID GAS. *(Aryusan gasu no sentakuteki toka maku). Text in Japanese. Preprint, Japan Chemical (Tokyo), 1p., 1971. (Presented at the Japan Chemical Society Annual Meeting, 24th, Tokyo, March 1971, Paper 3410.)*

The rate of sulfur dioxide transmission through plastic membranes is sometimes much greater than that of air. To aid in the recovery elimination, and separation of SO2, the transmission speed of various gases through various kinds of transmission membranes was studied. Using a gauge made by Shibayama Scientific Instruments Co., the transmission speed of various gases was tested. The gases were passed through the 10v sq cm dimension of membranes, with 1 pressure difference in the two sides of the membrane. The thicknes of the membranes was 10-100 micron. Despite the great change in the respective transmission speeds, the transmission ratio between SO2 and air remained unaffected by the thickness of the membranes. The polyvinyl chloride membrane's SO2 selectivity was greatly affected by the amount of dioctyl phthalate, the plasticizer. Also, the relationship between DOP percentage and transmission speed ratio of various gases was studied. While hydrogen had 3-5 times the speed of air, and helium 2.5-4 times that of air, SO2 alone had the same transmission speed in low DOP area. In high DOP area, the transmission speed goes up for both SO2 and air, especially SO2; it exceeds H2 around 15% DOP, reaching 80 times the maximum. This indicates that SO2 diffusion is quite different from the simple mechanical diffusion. The irregularity seen up to the range of 10% DOP is considered to be the abnormality because of DOP, in keeping with reverse-plastic phenomenon of polyvinyl chloride. It is difficult to measure the speed of transmission at more than the 40% DOP range, because the membranes are excessively softened. The materials used for the membranes are soft polyethylene, hard polyethylene, propylenethylenes, polypropylene, polystyrene, 6-nylon, tetron, cellophane, polyvinyl chloride, and chloride vinyl (with 30% DOP).

11325 APTIC NO. 29083

Cahn, David S.

AGGLOMERATION OF STEEL PLANT FURNACE DUST WITH CEMENT BINDERS. *Cement Technol., 2(1):15-17, 20-24, Feb. 1971. 5 refs.*

Pilot plant and laboratory tests were made on blends of steel plant flue dust and Portland cement to determine whether the flue dust could be pelletized for use as a source of iron in dry process cement manufacture. Strength and setting time results showed that an acceptable agglomerate can be made with a Type II Portland cement binder. Abrasion-resistant and well-sized pellets were made in a horizontal drum, using simulated closed circuit, with a binder content of 7.5% and a moisture content below 15%. Pellet quality was relatively insensitive to changes in binder concentration above 5%. Simulations of stockpiling and weathering indicate that little difficulty would be encountered with the use of flue dust pellets in cement plants. (Author introduction modified)

11326 APTIC NO. 29085

Coulter, T. R. and R. L. Reveley

PRECIPITATOR-SCRUBBER COMBINATIONS FOR RECOVERY BOILERS: A CASE HISTORY. *TAPPI, 54(4):530-532, April 1971. 4 refs. (Presented at the Water and Air Conference of the Pulp and Paper Industry, Minneapolis, Minn., June 7-10, 1970.)*

Design criteria and data are presented for two spray scrubbers intended to reduce particulate emissions from two kraft mill recovery boilers. The first unit follows an existing 500-ton recovery boiler electrostatic precipitator of 95% efficiency; it should raise overall collection efficiency to 98.5%. The second scrubber follows a very high efficiency electrostatic precipitator for a new 850-ton boiler. This scrubber was selected to eliminate any possibility of 'snowing' or carryover from the precipitator. Made of fiber glass reinforced polyester, the scrubbers act as cyclones, causing the entrained particulate matter to move toward the walls of the tank where it is wetted by the sprays and runs to the bottom to be drawn off. 'Core busters' located above the sprays prevent droplet carryover. Weak wash is the tentative scrubbing medium for the first scrubber, and fresh water the tentative choice for the second scrubber. Effluents from the bleach plant caustic stages will also be tried. Operational data on the scrubbers will be presented in a later report.

11327 APTIC NO. 29086

Sparks, Leslie E. and Michael J. Pilat

EFFECT OF DIFFUSIOPHORESIS ON PARTICLE COLLECTION BY WET SCRUBBERS. *Atmos. Environ., 4(6):651-660, Nov. 1970. 17 refs.*

The effects of diffusiophoresis (the sum of the forces due to Stephan flow and to gas momentum transfer processes) on particulate collection by wet scrubbers are considered. Single droplet collection efficiencies are calculated for particle collection by the combined mechanisms of inertial impaction and diffusiophoresis. The resulting single droplet particle collection efficiencies are used to calculate overall scrubber efficiencies for positive, negative, and zero diffusiophoresis. The calculations indicate that negative diffusiophoresis (droplet evaporation) can cause poor scrubber performance, especially for small particles, while positive diffusiophoresis (condensation) can result in greatly improved particulate collection. Additional information on scrubber liquid temperature, vapor concentration, droplet size distribution, and particle collection efficiencies is needed to verify the calculated results. The need for this data is increasingly important in light of proposed air quality standard which will require particle removal efficiencies near 100% at emission sources. (Author abstract modified)

11328 APTIC NO. 29088

Heneghan, William F.

ACTIVATED CARBON–A FINAL FILTER. *Pollut. Eng., 1(2):18-20, Jan.-Feb. 1970.*

The feasibility of activated carbon adsorption for air pollution control and liquid phase pollution control is examined. Use of activated carbon should be considered when the concentration of an air contaminant is less than 25 ppm, permissible emanation of a pollutant is 100 ppb or lower, gas stream temperature is below 100 F, and pollutant concentration is random, e.g., spills of noxious chemicals. Design and economic considerations relative to carbon beds are presented. Use of carbon in the final treatment stage should also be investigated when tertiary treatment of liquid waste is required. In this connection, an import design aspect is the nature of the wave front, i.e., the number of feet of bed between the point of saturation of the carbon and the point at which the lowest concentration or breakthrough of the contaminant can be detected. The wave front will also affect the choice of a system -- fixed bed or moving bed. Methods of regenerating and reactivating carbon are reviewed, and the economics of regeneration vs. replacement are considered.

11329 APTIC NO. 29089

Ashman, R.

A PRACTICAL GUIDE TO INDUSTRIAL DUST CONTROL. *J. Inst. Heating Ventilating Engrs. (London), vol. 38:273-282, March 1971. 7 refs.*

The choice of dust extraction equipment for a specified duty is determined mainly by the following factors: extraction efficiency required; dust characteristics such as particle size distribution, hygroscopicity, wettability, solubility, permeability, flammability, and electric properties; nature of the carrying gas, including temperature, moisture content, dust concentration; materials of construction; capital cost and total annual cost; space requirements; reliability; and accessibility for maintenance. A brief description is given of equipment representative of the following main categories: centrifugal separators, wet scrubbers, electrostatic precipitators, and filters. In addition, relative costs and efficiencies of the various equipment are summarized and the wide scope of application of available equipment is indicated by a chart. A combination system is schematically illustrated, with the individual equipment comprising the system tabulated along with equipment duty. Reference is also made to the prevention and control of fire hazards and explosions.

11330 APTIC NO. 29104

Coleman, L. F. and A. K. Postma

WASHOUT OF GASEOUS IODINE SPECIES. *Atomic Energy Commission, Washington, D. C., Fallout Studies Branch and Battelle Memorial Inst., Richland, Wash., Pacific Northwest Lab., Precipitation Scavenging Proc. Symp. Richland, Wash., 1970, p. 271-288. 12 refs. (June 2-4.)*

A program was conducted to provide experimental verification of models of fission-product removal by engineered safeguards in nuclear reactor containment vessels, and eight experiments to measure the washout of airborne iodine species by aqueous sprays are described. The spray chamber volume was 750 cu m, and the average drop fall distance was 11.6 m. The spray drop size was 0.77 or 1.2 mm volume median diameter. Other parameters considered in this study were temperature, spray flow rate, and spray solution composition. Spray washout models are presented for elemental iodine and methyl iodide. Absorption rates measured for elemental iodine agree with a theoretical model based on mass transfer limited by gas-phase resistance. Methyl iodide washout was in agreement with a model based on absorption with simultaneous chemical reaction. (Author abstract modified)

11331 APTIC NO. 29108

Greenberg, H. H. and R. E. Conover

IRON FOUNDRY EMISSIONS: A STUDY. *Foundry, 99(4):AP-18 to AP-23, April 1971.*

Iron foundry processes fall into the following areas: raw material storage, preparation, and charging; metal melting; molding, pouring and casting shakeout; sand conditioning and reclamation; coremaking; and cleaning, heat treating, and finishing. Emissions from each area are classified as to type, concentration, particle size, relative control liability, and relative control cost. In addition, 10 research and development projects are recommended to bridge the gap between existing technology and that required for improved emission control capacities. Iron melting operations, especially cupola melting, are identified as among the areas of highest priority with regard to additional development work. Particulate emissions from iron melting have been estimated at 243,000 tons/yr with approximately 182,000 being discharged to the atmosphere.

11332 APTIC NO. 29114

Teller, Aaron J.

NEW CONCEPTS OF POLLUTION CONTROL. *Trans. N. Y. Acad. Sci., 32(7):837-842, Nov. 1970.*

Pollution control has been looked on as a 'nonprofit necessity' rather than as a source of material for recycle or sale. Because of this, engineers have incorrectly applied the technology of product separation to highly concentrated streams. What is needed for engineering solutions to air pollution problems is acceptance of the fact that boundary conditions are distinctly different from product-oriented separations. These conditions are discussed and four successful approaches to abatement based on their consideration are presented. A cross-flow scrubber permits 99.7% recovery of hydrogen fluoride and silicon tetrafluoride. A Brownian separator is capable of removing submicron liquid particles at pressure drops of 5-30 in. wg, while a nucleation scrubber collects both liquid and solid submicron particulates at a pressure drop of 2 in. wg. A new cooling tower provides cooling of 25,000,000 BTU/hr in a ground space of 120 sq ft. The surface-renewal capability of the packing internals constantly creates new surface for rapid mass heat transfer. A 'looped system' recycles hydrogen fluoride and submicron boron oxides back to the process, while dissipating the thermal energy in the exhaust in a cooling tower.

11333 APTIC NO. 29121

SULFURIC ACID COOLER OF STAINLESS STEEL. *(Schwefelsaeurekuehler aus rostfreiem Stahl). Text in German. Chem. Rundschau (Solothurn), 24(5):79-80, Feb. 3, 1971.*

With the increasing size of sulfuric acid plants, coolers made of cast iron are no longer suitable. At a sulfuric acid production capacity of 1200 tons/day, such coolers would pose a considerable air pollution hazard. To prevent this, stainless steel coolers have been introduced in a variety of sizes. The coolers are combined in whatever number required for a certain capacity, to form one unit that is supported either by one of the acid towers or by a specially constructed frame. A tank sufficiently large to hold all acid in the tower and the cooling system is placed beneath the cooling unit. The heat exchanger is of corrosion-proof design. The water enters the pipes at high speed so that deposition or local concentration of impurities is avoided. An anodic passivation is achieved through use of a single Hastalloy-C-cathode which goes through the center of the pipe arrangement. Insulation from the exchanger is obtained be means of perforated teflon cover.

11334 APTIC NO. 29123

Short, W.

POLLUTION PROBLEMS FROM COMBUSTION PROCESSES. *J. Fuel Heat Technol., 18(1):23-24, Jan. 1971. (Presented at the Association of Public Health Inspectors, Blackpool, England, Sept. 1970.)*

Attention is called to problems encounterd in the combustion of hydrocarbon gases and to the difficulty of operating small incinerators smokelessly. If hydrocarbon gases are exposed to high temperature without excess air, there is a danger they will crack to simpler compounds and release fine carbon dusts or smokes. These are notoriously difficult to ignite, and temperatures around 1000 C may be necessary. It is also noted that the Clean Air Act (British) does not lay down any figures for permissible dust and grit contents in flue gases leaving boiler plant chimneys. Contents of about 0.2 to 0.3 grains/cu ft of gases (at NTP) have been proposed. However, this emission would be a considerable nuisance if all the solids were in the form of relatively large particles, e.g., about 75 micron. Other things being equal, a hotter plume rises further than a cool one; alternatively, a thick column with a greater mass of gases rises further than a thin column of less mass. If, after increasing gas temperature and gas mass, ground-level concentrations are higher than desirable, increasing stack height may be the only solution.

11335 APTIC NO. 29126

Rinehart, W. E., S. A. Gendernalik, and L. F. Gilbert

FUEL FACTORS IN AUTOMOTIVE TAILPIPE EMISSIONS. *Am. Ind. Hyg. Assoc. J., 32(3):179-187, March 1971. 25 refs.*

Fuel factors affecting tailpipe emissions are surveyed on the basis of existing published information and unpublished research data. Special emphasis is given to the proposed use of nonlead fuels and the effects of removal of lead antiknocks on tailpipe emissions. A nonleaded low-octane fuel used in low-compression engines adjusted for optimum driveability might be expected to yield, at the tailpipe, 5-10% more carbon monoxide, 10-14% more aldehydes, and 25% less particulate matter. Since automotive particles are only 4% of the total atmospheric particulate load, the overall improvement resulting from the removal of lead antiknocks is of questionable significance. Aromatic-enriched fuels of the present octane number, but without lead antiknocks, will greatly change the character of hydrocarbon emissions. Reactive components will increase by 38%, aromatic aldhydes by 70%. There will also be a large increase in polynuclear aromatics. It is concluded that removal of lead from automotive fuels is not a satisfactory approach to the emissions problem.

11336 APTIC NO. 29130

Naoi, Yasukazu, Naomi Eko, and Nobuo Inagaki

ON CONDITIONS FOR PROPER USE OF ACTIVATED CARBON AS AN AIR PURIFICATION AGENT (1) - ITS EFFICIENCY FOR REMOVAL OF H2S GAS. *(Kuki seijozai to shiteno kasseitanso no tekisei shiyo joken ni tsuite(1) - H2S gasu no jokyo koka). Text in Japanese. Preprint, Japan Society of Air Conditioning Hygienic Engineering, Tokyo, 1971. (Presented at the Air Conditioning Refrigeration Societies Joint Meeting, Tokyo, Japan, April 20-21, 1971. Paper 6.)*

To determine the practical conditions in which activated carbon would give the optimum performance for removal of hydrogen sulfide gas, activated carbon-made filter material of a practical size was used under normal operating conditions of 9-46 C, 25-95% humidity, and 0.03-100 ppm. Thickness of activated carbon layer, surface wind velocity, density of H2S gas, quantity of dust feed and humidity were varied to determine the effect on the initial purification efficiency. Activated carbon filters of 10, 20, 30 and 40 mm in thickness were used for the thickness test. For the other tests, the filter was 30 mm thick, and the surface wind velocity was 0.2 m/sec (except for the test to determine effect of the wind velocity). The purification efficiency E (%) was calculated as follows: E equals (1-C sub 2/C sub 1) where C sub 1 was density at the entrance to the filter and C sub 2 density at the exit. The thicker the activated carbon layer, the higher is the purification efficiency. The optimum thickness is considered 30-40 mm. The purification efficiency decreases as the surface wind velocity increases. The decrease is light, up to 0.4 m/sec but drastic as from 0.5 m/sec and up, 0.3-0.4 m/sec is considered best. The purification efficiency remains unaffected by the gas density within the measurable range; it is practically unaffectd by humidity. The purification efficiency decreases with increased feed-in quantity of dust, so that it is advisable to combine the filter with a dust collector in case of a practical application.

11337 APTIC NO. 29131

Okuno, Toshihide and Masahiko Tsuji

ON THE REACTIVITY OF AMINES WITH OZONE. *(Aminkagobutsu to ozon no hannosei ni kansuru kenkyu). Text in Japanese. Hygo-ken Eisei Kenkyushu Kenkyu Hokoku (Rept. Environ. Sci. Inst. Hyogo Prefect.), no. 2: 1-5, March 1971. 3 refs.*

Oxidation with ozone removes the offensive odor due to amine compounds. At the same time, in order to eliminate the ozone's toxicity, it must be removed from the reaction system. To estimate the optimal conditions for the reaction with ozone, the reaction rate constant (K) and the free energy of three amine compounds (monomethyl amine, dimethyl amine, trimethyl amine) were measured. The ozone-amine gas reaction was carried out under a flow system using tubular reaction apparatus at constant temperature and flow volume (500 ml/min). To determine reaction order, experimental data was inserted into the different integrated rate equations until K was found. The concentration of amines and ozone ranged from 20-50 times 1,000,000 mole/l to 4-5 times 1,000,000 mole/l, respectively. The reaction rate constant (l/mole and free energy (Kcal/mole) of amines at 20 C were as follows: MMA (monoethyl amine) 0.161 times 10,000 l/mole and 4.88 Kcal/mole, DMA (dimethyl amine) 3.340 times 10,000 l/mole and 8.41 Kcal/mole, TMA (trimethyl amine) 1.380 times 10,000 l/mole and 12.57 Kcal/mole In the reaction of DMA at 28.75 times 1,000,000 mole/l with ozone at 4.35 times 1,000,000 mole/l at 10 C, the residual volume of ozone was zero when the reaction time was more than 2.25 seconds. These results play an important role in the structure of a deodorizing apparatus. The linear velocity in the ordinary gas ducts of factories is more than 1 m/sec. Therefore the contact time of ozone in the presence of MMA requires more than four seconds and a reaction tube of larger than four meters.

11338 APTIC NO. 29139

Schneider, H. J.

TOTAL ENERGY. ENERGY AND HEAT FROM THE INDUSTRIAL GAS TURBINE. *(Total Energy. Strom und Waerme von der Industrie-Gasturbine). Text in German. Energie (Munich), 23(4):140-141, April 1971.*

Total energy means that power and heat come from the same turboset. Total energy turbines are fired with natural gas and discharge no combustion products, the waste gases being collected and utilized. Combustion takes place at high air surplus (70 kg/kg fuel) because the air serves simultaneously as a cooling agent for the power plant. The hot waste gases contain enough oxygen (18% compared to 23% in the atmosphere) to permit combustion of gas or oil. In a pharmaceutical plant, the 500 C waste gases from the turbine serve as primary air for the high-pressure boiler.

11339 APTIC NO. 29140

RAPID TRANSIT SYSTEMS 1985. *(Schnellbahnen 1985). Text in German. Umwelt (Duesseldorf), 1(1):35-37, 1971.*

A traffic study titled Street Traffic 1985 comes to the conclusion that more public transportation systems are necessary to reduce the number of passenger cars on the streets. Several such rapid transit systems are in the planning stage in various countries, e.g., the aerotrain in France and the hovertrain in Great Britain. In West Germany, efforts are under way to abolish long-distance transportation of material by trucks. Railbound vehicles traveling at high speed but producing no noise or waste gas will be used instead. To some extent such railbound trains are also being developed for passenger transport. The Transrapid system is designed to carry passengers at a speed of 500 to 600 km/h. The trains will run on rails resting on a structure rising 6 m from the ground. No final decision has yet been made as to the drive of the train. Three methods are under consideration; the magnetic suspension, air cushion and linear motor, or air cushions and jet engines. It is expected that development will take 7 years. The train itself will be 45 m long and will have a total weight of 70 Mp. It will seat 150 to 220 passengers.

11340 APTIC NO. 29148

Mason, John F.

THE ELECTRONIC CAR GETS A GREEN LIGHT IN DETROIT. *Electronic Design, 19(10):22-26, May 13, 1971.*

To comply with the 1965 engine exhaust regulations, automobile manufacturers are working toward the goal of a computerized adaptive control system for the entire engine--one that senses, identifies, and eliminates excessive effluents in the exhaust by changing the outputs. Adaptive engine control involves the ignition; fuel injections; exhaust gas; recirculation of the exhaust gas (for protection of catalyst beds); sensors; actuators, and reliable switches. The various electronic subsystems now in use or under development are reviewed. One computerized system described includes an electronic fuel injection system that sends exhaust gas back to the engine for recycling in precisely the right amount. It also includes an electronic ignition system. Another system reduces nitrous oxides by a combination of factors involving valve timing, retarding of the spark advance at low vehicle speeds, and use of low temperature theromostats. Also noted is an adaptive speed-control system that uses a c-w doppler radar and computer which display range and range rate between one car directly in front.

11341 APTIC NO. 29149

Habashi, Fathi

PRESSURE HYDROMETALLURGY: KEY TO BETTER AND NONPOLLUTING PROCESS. *Eng. Mining J., 172(5):88-94, May 1971. 21 refs.*

Hydrometallurgical processes using autoclaves are reviewed with special reference to the leaching of bauxite, tungsten molybdate ores, oxidized nickel ores, uranium ores, sulfides, arsenides and to the precipitation of nickel, cobalt, and copper sulfides. Plants using pressure leaching and pressure precipitation processes, some of which are illustrated by flowsheets, are identified. Reagents and pressures used for each raw material are noted together with metals recovered and byproducts.

11342 APTIC NO. 29159

Poglazova, M. N., G. E. Fedoseeva, A. Ya. Khesina, M. N. Meisel, and L. M. Shabad

THE OXIDATION OF BENZ(A)PYRENE BY MICROORGANISMS IN RELATION TO ITS CONCENTRATION IN THE MEDIUM. *Dokl. Biol. Sci. (English translation from Russian of: Dokl. Akad. Nauk SSSR), 179(2): 199-201, March/April 1968. 3 refs.*

The oxidation of benz(a)pyrene (BP) by Bacterium megaterium mutilate was studied using meat-peptone broth cultures and soils contaminated by hydrocarbons in industrial waste. In both cases, the oxidiative capacity of the bacteria was directly dependent on the BP concentration, increasing with increased concentration. However, the amount of BP destroyed was significantly higher for microorganisms cultured in soil than for those grown on the meat-peptone broth. At a BP soil concentration of 130 mg/kg, the bacteria oxidized 80-85% of the bacteria. In a related experiment, natural soil microflora were also found to be highly effective in destroying BP in soil when present in high concentrations. These observations show that the metabolic activity of bacteria is one of the most important factors in the destruction of high concentrations of carcinogenic hydrocarbons in soil. This process can be regulated either by the quantitative content of aromatic hydrocarbons or by differences in composition of the microflora.

11343 APTIC NO. 29160

Sotoodehnia-Korrani, Ahmad and Ken Nobe

REDUCTION OF NITRIC OXIDE WITH ETHYLENE ON COPPER-SILICA CATALYST. *Ind. Eng. Chem. Process Design Develop., 9(3):455-459, July 1970. 14 refs.*

The reduction of nitric oxide with ethylene on a copper-silica catalyst was investigated at 270 to 430 C in both integral and differential flow reactors. The nitric oxide and ethylene concentrations were varied from 300 to 1500 and 500 to 1500 ppm, respectively; the flow rate of carrier gas (nitrogen) was maintained at 400 l (25 C, 1 atm) per hr The results indicate that the catalytic reduction of nitric oxide with ethylene is essentially complete to carbon dioxide, water, and nitrogen. Additionally, the results suggest the potential of copper-silica as a means of simultaneously eliminating nitrogen oxides and unburned hydrocarbons from the exhausts of combustion devices burning hydrocarbon fuels. An empirical kinetic expression provides a satisfactory correlation of the experimental kinetic data. (Author abstract modified)

11344 APTIC NO. 29184

Franklin, David M.

THOSE TERRIBLE TEEPEES CAN BE EFFECTIVE. *Pollut. Eng., 3(1): 28-30, Jan.-Feb. 1971.*

Wigwam refuse burners for wood wastes, cotton gin waste, peanut hulls, and some municipal waste are the source of many localized pollution problems. Two types of pollution controls can be applied to wigwam units: glass cleaning equipment or basic modifications to the combustion process. Of the two, the most successful and economical to date has been that of basic modifications to the combustion shell and techniques to control the fuel and air mixture. The modifications include close natural draft ports, controlled high velocity overfire air, controlled underfire air, dome dampers, and control of air volume by electronically modulating dampers on fan inlets. For smoke and particulate control for wood waste, wigwam temperatures should be 750-900 F.

11345 APTIC NO. 29187

Jensen, Robert M.

FABRIC FILTERS: WORLD S GREATEST VACUUM CLEANERS. *Eng. Mining J., 172(4):88-90, April 1971.*

In considering fabric filters from an engineering point of view, one is rarely concerned with prediction of efficiency, for fabric filters have the capability of 99% almost automatically, provided they are maintained in proper operating condition. The engineering problem is the selection of size, fabric, cleaning method and cycle, and operating pressure drop which will yield operational reliability for long periods at minimum overall cost. Humidity is a particularly important factor; operation must remain above the dew point at all times to prevent excessive residual deposits and so-called blinding of fabrics. Since all filter suppliers utilize substantially the same fabric filter media, the principal distinction between the fabric filters of different manufacturers is the method of bag suspension and cleaning.

11346 APTIC NO. 29195

Teller, Aaron J.

A FRESH LOOK AT THE TECHNOLOGY OF PARTICULATE REMOVAL VIA SCRUBBING. *Eng. Mining J., 172(4):81-82, April 1971.*

A cross-flow nucleation scrubber and a dry scrubbing process are described for abating air pollution due to particulates. In the case of the cross-flow nucleation scrubber, the power consumption is independent of the particle size to be recovered inasmuch as the system converts the submicron particles to 3 micron particles durin the collection process. Thus, the system takes advantage of the excess free energy of submicron materials, the excess being reflective of the high surface-to-mass ratio. This excess energy is reflected in a charge that results in a higher rate of condensation on that particle compared with larger particles. The absorbent in the dry scrubbing method is one of a number of inexpensive extended surface solids coated with a mono to ter-molecular layer of reagent that can be chosen as a specific or general in its absorbent capabilities. The speed of absorption is from 100 to 500 times faster in this method than in a wet scrubbing method, since diffusion is not required through both the gaseous and liquid phases.

11347 APTIC NO. 29199

TWO DIRECT SMELTING PROCESSES DESIGNED FOR POLLUTION CONTROL IN COPPER PLANTS. *Eng. Mining J., 172(4):129, April 1971. 1 ref.*

Two direct smelting processes for treating copper concentrates which telescope conventional reverb-converter treatment into one unit are being developed to control pollution. In the Noranda Mines Ltd. process, concentrates and feed are introduced in one end of the reactor which is similar in cross-section to a Peirce-Smith converter. Smelting takes place at the feed end, while matte and slag flows are controlled as they move slowly to tapping ports. Oxidizing gas is introduced into the matte to oxidize the iron sulfide. Continued injection of the gas into the resulting white metal gradually oxidizes the cupric sulfide to metallic copper. Advantages claimed for the Noranda process include ready recovery of sulfur for the production of sulfuric acid, savings in fuel costs, lower labor requirements, and an improved plant environment for workers. In the WORCRA continuous bath-smelting process, invented at Conzinc Riotinto of Australia Ltd., metal is produced directly from concentrates in one unit. Most of the exothermic oxidation reactions are generated and continue in the liquid bath, while turbulence is generated in the smelting and converting zones by lance-injected oxygen-containing gas. Slag moves countercurrent to matte and metal flow in the converting zone. Furnace gases rich in SO2 can be cooled and cleaned for waste heat utilization and production of sulfuric acid; or because of low oxygen content, the gases can be used to produce elemental sulfur.

11348 APTIC NO. 29212

Higgins, R. I. and J. A. Bright

BCIRA SYSTEM OF DUST CONTROL FOR A HIGH-SPEED PEDESTAL GRINDER. *Foundry Trade J. (London), 130(2824):73-77, Jan. 21, 1971. 2 refs.*

When iron castings are ground on a pedestal grinder, metal is removed in the form of separate particles which cover a continuous range of sizes from several thousand micron to one micron. The basic principles of effective dust control on pedestal grinders and methods of capturing primary and secondary dust streams are described and considered in relation to high-speed grinding. A very efficient system of dust control has been developed for the Richards 30 by 3 inch pedestal grinder operating at a constant speed of 12,500 surface ft per min. This system of dust control consists of a flexible airtight seal between the spindle housing and the grinding wheel casing, as well as an extraction hood complete with an integral louvred or perforated adjustable tongue on top of the casing. An air extraction of 1000 cu ft/min at 4.5-inch wg hood suction is applied to this arrangement. Also, an air extraction of 1500 cu ft/min at 4.5-inch eg hood suction is applied to a 7 1/2 by 5-inch spigot located at the back of the machine hopper. (Author summary modified)

11349 APTIC NO. 29213

Virk, K. S. and J. A. Weber

DIESEL EXHAUST SMOKE AND BARIUM FUEL ADDITIVES. *Trans. ASAE (Am. Soc. Agr. Engrs.), 13(6):758-761, Nov.-Dec. 1970. 7 refs. (Presented at the Ameican Society of Agricultural Engineers, Annual Meeting, Lafayette, Ind., June 1969, Paper 69-105.)*

A study was undertaken to compare exhaust emissions and engine performance with additive and non-additive diesel fuel. Three levels of barium additive--0, 0.25, and 0.50% by fuel volume--were used in a Lanova-cell, combustion chamber diesel engine. Comparisons of the smoke indexes, exhaust densities, horsepower ratings, and specific fuel consumption levels were made at maximum torque, at maximum horsepower at rated speed, and at part loads for three diesel, fuel-pump flow settings. The barium additive acted in three ways to reduce the blackness of the diesel smoke: it affected the combustion process, so that less soot was emitted at full loads, but exhaust density was increased as part loads; it broke down the larger soot particles into smaller ones; and it affected the color of the soot from black to brownish-black at part loads, but not at full loads. An additive level of 0.30 to 0.35% by volume was sufficient to keep the smoke index at less than 4.8 for all loads and speeds, including peak torque, when the nonadditive fuel flow had been set for an index of 5 at maximum power, rated speed. This additive can be used to prevent excessive exhaust soot as fuel flow is increased. Increasing fuel flow from 29.5 to 33.6 lb per hr increased maximum horsepower 9.2%. Use of the 0.25% additive level with the higher fuel flow reduced the smoke index to 89% of the index with a nonadditive fuel flow of 29.5 lb per hr. At the same fuel-flow setting, there was no significant differences in horsepower or specific fuel consumption between the additive and nonadditive fuels for any of the test conditions. Assuming a limit of 5 on the smoke index, the barium additive would not be useful in farm tractors, except at intermittent extreme loads, if the engine is in good condition and is not overfueled. (Author summary modified)

11350 APTIC NO. 29215

Pfoutz, Bill

WET SCRUBBING ADDS A GAS-COOLING EFFECT TO DUST COLLECTION. *Eng. Mining J., 172(4):86-88, April 1971.*

In a wet scrubber, the priamry aerosol particles are confronted with so-called impaction targets, which can be wetted surfaces or individual droplets. As the primary particles attempt to follow the gas stream around the target droplets, their inertia causes them to move relative to the stream lines toward the surface of the droplet. A certain percentage of particles in the total cross-section swept out by the droplet will be collected by the droplet; this percentage is known as the target efficiency of the droplet. Target efficencies have been correlated with a dimensionless parameter known as the impaction parameter or separation number. An efficiency equation is presented which shows that the higher the impaction parameter, and the higher the liquid-to-gas ratio, the higher the efficiency. The impaction parameter equation shows that high efficiencies are obtained when particle radius, particle density, and relative velocity between particle and target droplet are high, and when gas velocity and target droplet size are low. Critical variables in wet scrubbers are discussed.

11351 APTIC NO. 29216

Kelly, G. H., Jr.

ELECTROSTATIC COLLECTORS PROVIDE HIGH EFFICIENCY. *Eng. Mining J., 172(4):90-91, April 1971.*

The basic elements of an electrostatic precipitator comprise a source of unidirectional voltage--a corona or discharge electrode, a passive or collecting electrode, and a receptacle for storage of collected material. The corona provides a source of uni-polar gas ions which fill the interelectrode space with a uni-polar space charge. Particles entrained in the gases passing through this space charge collect these gas ions and themselves become highly charged. The same electric field that has produced the space charge then becomes the collecting field according to Coulomb's Law, and the charged particle is caused by this force to migrate toward the passive or collecting electrode. The basic equations which govern the electrostatic precipitation process are cited. Efficiency is related primarily to the collecting electrode surface area per unit volume of gas treated, and the so-called 'particle drift velocity' or precipitation rate parameter. Electrical conductivity (or resistivity) and other important operating factors are mentioned.

11352 APTIC NO. 29217

Marting, Donald G. and George E. Balch

CHARGING PREHEATED COAL TO COKE OVENS. *Blast Furn. Steel Plant, 58(5):326-329, May 1970. (Presented at the Iron and Steel Institute, Coke in Iron Making Meeting, London, England, Dec. 10-11, 1969.)*

The principal advantages to be derived from the charging of preheated coal to coke ovens are that the required residence time in the coke oven is drastically reduced, while the use of lower cost weakly coking or high oxygen coals to be utilized for a major portion of the coal mix can be used. A reduction in air pollution is accomplished through the use of closed system pipeline charging to replace conventional larry car charging. The system appears to be readily adaptable to automation, while the improvement in battery top conditions helps to solve the increasingly more difficult problem of finding people for this work. Laboratory and early experimental work on preheating are mentioned, as well as pilot plant demonstrations and attempts at commercial operation.

11353 APTIC NO. 29227

Staples, Gordon A.

AIR CONTAMINATION CONTROL BECOMES INCREASINGLY IMPORTANT. *Can. Paint Finish., 45(4):41, 43-44, April 1971.*

Bright dip, anodizing, pickling, and plating operations in the plating industry, if not controlled, can cause localized air pollution problems that are both a danger to workers and damaging to property. Reducing the volume of air and cost of the control equipment can be accomplished by improving the design of hoods used to collect the fumes. The more completely a hood encloses an operation, the less air that is required for complete capture and removal of the contaminant. This reduction in air volume not only reduces the size of the fume scrubber, but also reduces the size of ductwork, fan, stack, and recirculation pump and piping. Wet collectors are used most frequently in the removal of mists and gases. A typical vertical packed tower for removing gaseous types of impurities is a fume scrubber designed so that gases enter the bottom of the scrubber and flow counter-current to the absorbent solution. The use of chemicals frequently improves the efficiency of the scrubber as well as reducing the cost of operation. Other types of towers are mentioned, as well as cyclonic units. Another highly efficient type of fume scrubber for removing mist is the impingement type wet scrubber.

11354 APTIC NO. 29231

Nakai, Yoshiyuki and Tetsuya Yokokawa

ACTUAL EXAMPLES OF KANAGAWA RESEARCH INDUSTRIAL INSTITUTE TYPE DESULFURIZING UNIT FOR WASTE GAS. *(Shin ko shi shiki haien daturyu sochi no gutaiteki jitshi rei). Text in Japanese. Kagaku Kogaku (Chem. Eng.), 35(1):36-42, Jan. 1971.*

Practical Kanagawa Research Institute type desulfurizing units for waste gas classify roughly into nonrecovering and recovering gas absorbing units. The nonrecovering type uses fresh or sea water as the absorbing solution for sulfur dioxide. The absorbing solution is released in a harmless condition without recovering the SO2. The recovering type effectively uses absorbed SO2 without causing a public nuisance. The gas and absorbent contact, but the liquid s surface tension causes them to form a thin surface on the wire mesh. Gas sucked into the unit cannot pass through without contacting the liquid plane. Also, the gas-liquid rate can be arbitrarily decided. If a greater rate of gas to liquid is needed, the quantity of flowing liquid is increased. Pressure loss at the contact surface is not related to the change of the liquid-gas rate. An actual example is the use of desulfurizing with hydrogen in the final gas treating unit in petroleum refining. When hydrogen sulfide produced by hydrogen desulfurization enters the combustion furnace for waste gas and becomes sulfurous anhydride, the desulfurizing unit is needed for high concentrations. Another application is the treating unit for waste gas from sintering furnaces in iron foundries. This gas is of fairly high concentration. Further, the gas includes many powder dusts but the KRI-wet-type has a good ability to manage for the structure without kinetic parts. Also, the waste gas treatment unit from the boiler in paper mills makes a caustic soda solution absorb sulfurous anhydride in waste gas. The produced sodium sulfate is used as a medicine for a pulp steam bath.

11355 APTIC NO. 29234

Schwabe, P. H.

GAS AND VAPOUR FILTRATION WITH SPECIAL REFERENCE TO ACTIVATED CARBON. *Filtration Separation (Purley), 8(2):153-157, 164, March-April 1971. 5 refs. (Presented at the Filtration Society Meeting, Swindon, England, July 7, 1970.)*

Numerous methods for the elimination of unwanted gases and vapors are available, of which filtration employing adsorption on active charcoal is the least specific and generally the least complicated to install. Liquid scrubbing, thermal oxidation, catalytic oxidation, adsorption by materials other than charcoal, and the use of activated granular charcoal are discussed. Careful selection of the charcoal, together with attention to granule packing, charcoal life, filter replacement, and available fan capacity are required in order that the best filter shall be made available. (Author conclusions modified)

11356 APTIC NO. 29238

Schuepp, W.

METEOROLOGICAL CONSIDERATIONS OF AIR HYGIENE. *(Meteorologisches zur Lufthygiene). Text in German. Chem. Rundschau (Solothurn), 24(11):199, March 17, 1971.*

The haze above cities reduces ultraviolet radiation on the ground by reflecting and absorbing it. Ultraviolet radiation is essential to humans however, because it kills many disease-causing germs and builds up vitamins. More recent observations have shown that large blast furnaces and jet airplanes may trigger precipitation. Fogs can be caused by industrial pollutants. In Basel, a daily average of 0.20 ppm has been set as the maximum allowable atmospheric concentration of sulfur dioxide in summer. The allowable winter daily average is 0.30 ppm. Continuous measurements of SO2 concentration in Basel revealed a maximum concentration of 0.15 ppm (daily average). The wind speed averaged 1.2 m/sec. The degree of air pollution depends on the pollution concentration and the dispersion. The higher a stack and flue gas temperature, the larger the air volume in which the pollutants can disperse. In Basel, heavy, cold air flows downward at night. The construction of buildings 50 to 100 m high has reduced the speed of this wind within the city limits and increased air pollution. Atomic power plants will, therefore, have to be shifted to neaby 100 m high hills. In addition, high stacks will be required so that the pollutants are ejected into the air above the cold air flow.

11357 APTIC NO. 29240

Watanabe, Sadaharu

COKE CAKE GUIDE CART WITH DEVICE TO PREVENT AIR POLLUTION. *(Kokus keiki annaisha ni okeru gaiki osen boshi sochi). Text in Japanese. (Shinwa Trading Co. (Japan)) Japan. Pat. Sho 45-38134. 4p., Dec. 2, 1970. (Appl. July 5, 1967, claims not given).*

A device was designed to prevent air pollution caused by the dispersion of coke dust when coke cakes are pushed out of a coke oven. Coke dust generation can be kept to a minimum and the dust generated will be effectively collected by a wet type dust collector. The following are installed on a track-guided cart next to the coke oven: the coke guide which guides coke cakes from the oven to the quench cart, the dust hood which absorbs dust gas rising from the coke cakes, and the dust collector which is connected to the dust hood. Dust gas generated during transfer of coke cakes through the coke guide is kept to a minimum and will never be discharged into the atmosphere. Since the coke guide is shaped so that is aperture gradually windens toward the exit and since it is made to plunge into the dust hood to assure air-tight connection while permitting free slide action, coke cakes will move very smoothly through the coke guide into the quench cart, thus giving a minimum crushing of coke cakes during the transfer to assure minimized generation of dust gas. Thus, less volume of air is needed for dust collection. As a result, a dust collector of smaller output capacity can be used with this system for economical operation.

11358 APTIC NO. 29241

Matsuyama, Takuzo and Osamu Kanda

ADSORPTION OF SULFUR DIOXIDE TO ACTIVATED CARBON UNDER CORONA DISCHARGE. *(Korona hodenka ni okeru kasseitan eno SO2 no kyuchaku dai 2 ho). Text in Japanese. Preprint, Japan Society of Chemical Engineering, Tokyo, p. 43-44, 1970. 3 refs. (Presented at the Japan Society of Chemical Engineering, Autumn Conference, 4th, Hiroshima, Japan, Oct. 6-8, 1970, Paper A208.)*

Much research and development has been done on the elimination of sulfur dioxide from combustion gases, but the problem is not yet completely settled. The adsorption rate of sulfur dioxide was promoted by the corona discharge. The promoted effect by the corona discharge in the scaled up apparatus was investigated, and the possibility of its application to the desulfurization of smoke is discussed. The outline of the apparatus (bench scale) is shown. Activated carbon Sirasagi G (grain size 4-6 mesh) and globular semi-coke (grain diameter about 4-6 mm) were used as adsorbents. The basket in which the activated carbon was packed was 15 cm in width, 50 cm in height, and 3 cm or 10 cm in thickness. The temperature of the adsorption experiment was 25 C, and the voltage was 5000-25,000 volt. The figure in which the out-put concentration of sulfur dioxide vs. time is plotted in the two cases of O volts and 25,000 volts shows that the corona discharge reduces out-put concentration. No lowering of the corona discharge effect was observed with the increase of Reg number. The activated carbon layer adsorbed the gas effectively in the region of about 3 cm from the surface. Thus, the promotion effect on the adsorption rate by the corona discarge is effective when the apparatus is scaled up. The pressure loss, which was about

2 cm H20, is negligible. The possibility of this application to smoke desulfurization processes is recognized.

11359 APTIC NO. 29245

Masuda, Senichi

ELECTRIC DUST COLLECTOR. *(Denki shujinki). Text in Japanese. Funtai Kogaku (Powder Eng.), 8(4):27-55, April 1971. 98 refs.*

A technical handbook of electric dust collectors is presented. Electric dust collectors are now widely used to check air pollution and at the same time recover valuables from the waste gas in various branches of industry including power generation, iron manufacturing, metallurgy, sulfuric acid manufacturingg and cement manufacturing industries. They have the capability of arresting extremely small dust particulates and a dust collection efficiency of 99% or higher. They operate at high temperatures (about 500 C) and/or under high gas pressures. They also feature less power consumption and a small pressure drop resulting in lower operationa cost, easy maintenance, and a lower maintenance cost. The manual contains a description of the basic electric dust collection mechanism, a classification of the construction of electric dust collectors, corona discharge, electric field distribution and ion current in the dust collector, electric charge and mobility of dust particulates, dust collection efficiency, flyout of dust once arrested, counterionization phenomena, gas distribution in the dust collection chamber, vibration of the discharge line, automatic control, and maintenance. A number of applicable theoretical formulas to calculate the variables affecting performance of an electric dust collector are also presented.

11360 APTIC NO. 29247

AIR POLLUTION AND THE MOTOR BUS. *Motor Coach Age, 23(5):14-20, May 1971.*

Compared to gasoline engines not equipped with pollution control devices, diesels emit much less carbon monoxide, significantly less hydrocarbons, and similar quantities of nitrogen oxides. There are three kinds of diesel smoke: white, blue, and black. White smoke consists mainly of unburned fuel and water droplets, and it appears during starting and warmup. Blue smoke is seen with high-mileage, worn engines and is principally due to lubricaring oil. Black smoke consists primarily of carbon particles and can be reduced by proper metering of fuel and good maintenance. All attempts that have been made to change diesel exhaust characteristics have been directed toward reducing observable smoke and odor. These have ranged from the scale of catalytic mufflers, through GM s environmental Improvement Plan kit, ($1100) to an extensive series of tests on buses equipped with E-series 6V-71 engine, an N-series GV-71, or a Cummins four-cycle engine. The catalytic mufflers reduce the output of aldehydes, the compounds most often associated with diesel odor, but do not suppress noise as effectively as stock mufflers. The GM kit, which incorporates a low sac needle, is claimed to cut smoke emissions below the level of visibility and to reduce hydrocarbons by 90%, CO by 30%, and nitrogen oxides by 17%. The Cummins four-cycle engine showed odor levels measurably lower than those from the E-series, but about the same as those from the N series. The closest bus engine ever produced was manufactured or modified to run on propane or butane which combusts to water and carbon dioxide under almost any obtainable conditions. Liquefied natural gas and compressed natural gas are both used for clean combustion but both suffer from storage problems.

11361 APTIC NO. 29251

Weston, Roy F.

FLUIDIZED BED DISPOSAL OF SECONDARY SLUDGE HIGH IN INORGANIC SALTS. American Society of Mechanical Engineers, New York, Incinerator Div. Natl. Incinerator Conf., Cincinnati, Ohio, 1970, p. 79-80. (Discussion, p. 17-21.) (May 17-20.)

Pilot-plant studies were conducted of the feasibility of fluidized-bed incineration of excessive activated sludge containing a combination of inorganic salts (calcium carbonate, calcium chloride, calcium sulfate, and sodium chloride). The fluid-bed incinerator tested was capable of both agglomerative and nonagglomerative operation. The first method involves a sand bed, the second a bed formed from the inorganic salts in the sludge. Pilot tests indicated virtually complete organic destruction without odor problems at bed temperatures between 1300 and 1500 F. Both systems of operation seemed acceptable. Based on the pilot-plant data, an incinerator was designed to handle 15% total solids and to burn 12,000 lb/day of dry solids. The system include provisions for separating particulates entrained in reactor gases in a cyclone. Fine solids from this cyclone can be discharged to a quench tank and from there transferred to a lagoon as inorganic ash, or they can be recycled to the reactor. The former mode represents the nonagglomerative mode, in which the start-up sand with subsequent makeup will always be the bed material. The recycle could be used to agglomerate the naturally fusing salts and thus to form a bed of particulate salts. Stack gases leaving the cyclone pass to a venturi scrubber guaranteed to limit stack emissions to less than 0.1 grains particulate matter/dry standard cu ft adjusted to 12% carbon dioxide.

11362 APTIC NO. 29253

Whitfield, W. J. and D. M. Garst

CONTAMINATION CONTROL: A STATE-OF-THE-ART-REVIEW. *Sandia Labs., Albuquerque, N. Mex., NASA Contracts W-12324 and H-13245A, Rept. SC-R-69-1154, 18p., Nov. 1968.*

Typical sources and contaminants are summarized together with categories of affected environments. The importance of the systems approach to contamination control is discussed, and the state of the art of control is reviewed as it applies to product design, control equipment and facilities, techniques and instrumentation for monitoring, personnel, and industrial applications.

11363 APTIC NO. 29261

Anderson, Leonard W.

ODOR CONTROL IN RENDERING BY WET SCRUBBING--A CASE HISTORY. *Preprint, Carolina By-Products, Inc., Greensboro, N. C., 7p., 1970 (?).*

Chemically basic odors (e.g., ammonia and amides) at a rendering plant are successfully scrubbed with a weak soda ash solution in 60,000 and 100,000 cfm spray scrubbers. All wetted parts of the scrubbers are 304 stainless steel. Polyvinyl chloride piping and polypropylene nozzles are used. The 60,000 cfm scrubber sprays about 300 gpm of solution at 15 psi through 200 spray nozzles; the 100,000 cfm unit pumps at 450 gpm through 300 nozzles. Operating costs of the scrubbers are minimal and installed costs were low: 65 cents per cfm for the 60,000 cfm scrubber and 60 cents per cfm for the larger unit. Because of the satisfactory performance of the scrubbers, the company will prematurely retire the incinerators formerly used for controlling odors.

11364 APTIC NO. 29274

Taylor, L. F.

THE NEUTRALIZATION OF SULPHUR DIOXIDE. *Ind. Chemist (London), vol. 16:325-328, Nov. 1940. 1 ref.*

The conversion of the sulfurous fumes from industrial processes into sulfuric acid, elemental sulfur, and liquid sulfur liquid sulfur dioxide are considered. In all but exceptional cases these operations will each require a preliminary stage in which the sulfur content of the emitted gases is increased. This condition requires either enrichment of the gases by adding a gas with high SO2 content, or introduction of a primary process in which SO2 is absorbed in a medium from whic it can be regenerated in a comparatively pure state. Probably the most practical system so far developed is that in which the absorbent solution contains basic aluminum sulfate; prepartion of the absorbent is mentioned. SO2 dissolves readily in water, the rate of solution being a function of the temperature, the interphase area, and the concentration of SO2 in the two phases. Neutralization of the acid content of the gases by a lime base is discussed, and operating details are considered. Practical tests indicate that certain definite advantages are to be obtained by using calcium sulfite as the absorbent. The calcium sulfite reacts with a further molecule of SO2 to form the bisulfite, an acid salt which is readily soluble in water. This bisulfite may then be treated externally to the absorption towers, with lime, to form two molecules of the normal sulfite again, half of which is rejected and half returned to the towers for further absorption of SO2.

11365 APTIC NO. 29281

Mattern, Konrad

PROCESS FOR RECOVERY OF MAGNESIUM OXIDE AND SULFUROUS ANHYDRIDE CONTAINED IN FUME GASES. *(Procede de recuperation d oxyde de magnesium et d anhydride sulfureux contenus dans des gaz de fumee). Text in French. (Metallgesellschaft A. G., Frankfurt (West Germany)) French Pat. Appl. 69-28945. 6p., Aug. 22, 1969. (6 claims).*

A method and apparatus for recovery of magnesium oxide and of the sulfurous anhydride contained in the fumes generated by the combustion of the residues from cellulose manufacturing described the fumes, carrying the magnesium in the form of ashes, and the SO2 as a gas are drawn by fans, from the flue to a vertical, cylindrical separating vessel. The latter houses nine rotating spray wheels mounted on top of each other on a vertical motor driven shaft. A water supply is introduced from outside for spray generation. The fumes enter the separator at its lower end, and are forced to pass first through the water spray produced by a group of three wheels, whereby the magnesium oxide particles are picked up and thrust against the inner wall of the separator vessel, from where the fluid containing the particles flows down via three sets of troughs and out through the bottom of the vessel. From there, a circulating pump pushes the liquid into the upper part of the vessel where it is fed downward through the upper group of six spray wheels with inter connecting troughs. The troughs collect the fluid from the inner wall and feed it to the spray units. In this upper spray area, the absorption of SO2 is effected by the sprayed fluid which already contains the magnesium oxide. Having passed the sixth wheel, the liquid containing the two recovered components leaves the vessel through a side outlet, while the remaining combustion gases are carried off through the top of the separator. The system is extremely economical in power consumption. Compared with a venturi type washer requiring 850 KW, this sytem would need only 80 KW.

11366 APTIC NO. 29283

(Inventor not given.)

PROCESS FOR REGENERATION OF SOLID ACCEPTORS OF SULFUROUS ANHYDRIDE. *(Procede pour la regeneration d accepteurs solides d anhydride sulfureux). Text in French. (Shell Internationale Research Maatschappij N. V. (Netherlands) French Pat. Appl. 69-29474. 11p., Aug. 28, 1969. (19 claims).*

The term acceptor applies to a metal or metal oxide in combination with a solid support material which is utilized for eliminating sulfur oxides from gas mixtures, for example from the residual gases emanating from combustion in industrial plants. The acceptors should be suitable for use at the temperature of combustion gases, about 200 to 500 C. In contact with the acceptor, the sulfurous or sulfuric anhydride is fixed by the metal or metal oxide, with which is forms a metal sulfate, so that the flue gases on leaving the chimney will cause less air pollution. A process for regenerating the acceptor is described in which the metal formed during the fixation is decomposed by a reducing gas, resulting in this gas becoming much richer in sulfurous anhydride than the original combustion gas. The regenerated acceptor can then be used again for purifying combustion gases, while the reducing gas can be utilized for producing either sulfur or sulfuric acid. Hydrocarbons are employed as reducing gases mixed with an inert diluent, preferably water vapor, which minimizes the formation of combustibl deposits on the acceptor during regeneration. The volume ratio of diluent to reducing gas may vary from 10:1 to 1:1. A suitable material for use as acceptor is copper or copper oxide. As solid support material, a vanadium compound and an alkaline metal compound are employed.

11367 APTIC NO. 29296

Tamura, Teijiro

THE CHEMISORPTION OF NITRIC OXIDE AND NITROGEN ON RHENIUM. *Bull. Chem. Soc. Japan (Tokyo), 44(3):590-595, March 1971. 29 refs.*

The chemisorption of nitric oxide and nitrogen on a polycrystalline rhenium filament was studied using flash-desorption mass spectroscopy. For the chemisorption of nitric oxide, the initial sticking probability was found to be close to unity, with a saturation coverage of 5.2 times 10 to the 14th molecules/sq cm at room temperature. Nitric oxide adsorbs nondissociatively, and dissociation occurs at an elevated temperature. The rate of the desorption of nitrogen from the nitric oxide layer is roughly proportional to Theta 2. The majority of the oxygen in the nitric oxide layer was presumed to be liberated as rhenium oxide. The nitrogen adsorption was investigated to compare it with that of nitric oxide adsorption. The saturation coverage and the initial sticking probability were 1.08 times 10 to the 14th power molecules/sq cm and 0.003, respectively. (Author abstract modified)

11368 APTIC NO. 29302

Kurita, Satoru, Takashi Watanabe, and Naoki Takayama

EFFECT OF COKE DEPOSITION OF CATALYTIC REACTION RATE OF HYDRODESULFURIZATION. *(Sesshoku suisoka datsuryu hanno nioyobosu tansoshitsu sekishutsu no eikyo). Text in Japanese. Kogyo Kagaku Zasshi (J. Chem. Soc. Japan), 74(5):939-943, May 1971. 2 refs.*

The effects of coke deposits precipitated on the catalyst by quinoline processing were studied in the desulfurization reaction of thiophene. Cobalt molybdenum alumina catalyst was prepared by kneading cobalt molybdate with alumina gel. The catalyst was made sulfide in a high-pressure reactor at 350 C for 2.5 hr in 3 kg/sq cm hydrogen with 3 vol% hydrogen sulfide. The hydrodesulfurization of thiophene was studied at 350-400 C temperature, which was monitored by an alumel-chromel thermocouple placed in the center of the catalyst. After a steady state was reached, thiophene-benzene with quinoline was led into the reactor to precipitate coke on the catalyst. Gas analysis before and after the catalyst poisoning was made by a gas chromatograph. The coke on the catalyst was analyzed by coulometry titration. The catalyst was also subjected to an automatic sulfur analyzer and JES-3BX for electron spin resonance study. Quinoline firmly absorbed to the active region of the catalyst, degrading the desulfurization activity. A part of the quinoline thus adsorbed changed to coke and precipitated on the catalyst. The higher the partial pressure and temperature of quinoline, the more was the amount of precipitate. The precipitated coke lowered the desulfurization activity. A relation between the coke deposit and rate constant was obtained in terms of the processing time. The catalyst poisoning was concluded to be due to the degradation of hydrogenation represented by the into n-butane.

11369 APTIC NO. 29311

Hesketh, H. E., A. J. Engel, and S. Calvert

ATOMIZATION--A NEW TYPE FOR BETTER GAS SCRUBBING. *Atmos. Environ., 4(6):639-650, Nov. 1970. 18 refs.*

Atomization of water by air in a venturi scrubber was studied by stop-action still photography to determine how and where atomization takes place and what happens to the droplets formed. Two distinct types of atomization can be made to occur: cloud type and drop-type. Cloud-type, a unique type of atomization, occurs when water is injected as a stream from nozzles greater than approximately 1 mm i.d.; drop-type occurs when smaller nozzles, spray nozzles, or dropping tubes are used which causes the water to enter the atomizer in drop (or sheet) manner. Atomization of streams produces smaller than predicted (less than 30 micron diameter) droplets which group in cloud like form. Atomization of drops gives the predicted larger size droplets for which size range and distribution equations ahve been developed and verified in many previous investigations. Both of these types of atomization were produced in the same apparatus of this study simply by modifying the water inlet nozzle diameters. The difference between the two types of atomization is explained on the basis of surface tension considerations: there is less surface area in a stream of water than in the same volume of water as drops, so less work is required to break up a stream. Cloud-type atomization results in both higher atomization efficiency and in lower acceleration rates for the atomized droplets. These factors are important in obtaining efficient dust collection using inertial impaction devices. Atomization occurred within 1.5 cm from the water inlets, so the lower the water droplet acceleration rate the better the collection results. Once atomized, clouds of water do not appear to agglomerate in the venturi diffuser. Critical or minimum air velocities required to produced atomization are dependent upon the liquid injection nozzle i.d., and an equation is included for obtaining the critical air velocities. (Author abstract modified)

11370 APTIC NO. 29312

Calvert, Seymour

VENTURI AND OTHER ATOMIZING SCRUBBERS: EFFICIENCY AND PRESSURE DROP. *Am. Inst. Chem. Engrs., 16(3):392-396, May 1970. 9 refs. (Presented at the American Institute of Chemical Engineers New York Meeting.)*

Atomizing scrubbers have been used for small particle removal from gas in a variety of applications and are a very important type of air pollution control device. Their operation is based on a gas stream atomizing liquid which is either introduced into the gas or is entrained from a pool on which the gas impinges. Equations are derived for predicting particle collection efficiency and pressure drop for venturi and other atomizing scrubbers. Despite some limitations, the equations represent the only rational design method available for atomizing scrubbers.

11371 APTIC NO. 29318

Monostory, F. P., W. Pickhardt, W. Simonis, and E. von Szantho

SEPARATION OF PYRITE FROM COAL DUST IN ELECTRIC AND MAGNETIC FIELDS - PART 2. *(Das Abscheiden von Pyrit aus Kohlenstaub im elektrischen und im magnetischen Feld (2. Teil)). Text in German. Aufbereitungs Technik, 11(10):599-614, Oct. 1970. 45 refs.*

Coal preparation plants in West Germany emphasize the separation of raw coal before wet treatment. Thus, 14 million tons of dust are removed yearly. The possibilities of employing electric separation processes was investigated. Those characteristics of the raw coal that allow predictions as to the efficiency of separation, with special emphasis on the separation of pyrite were also determined. Different methods of analyzis in order to obtain significant values of the coal dust were shown. Microscopic, physical, and chemical determinations produced factors which are used for the estimation of separation efficiencies. Experiments were carried out in order to move pyrite in the waste by activating the surface of the pyrite. The functions of distributions were described by regressive calculation. The possibilities of separating coal from inorganic minerals were examined in electric and magnetic fields. The effects of operation and operating conditions of a drum separator on the separating efficiency were evaluted. After examinations of the extention of the magnetic field in three directions by measuring the field intensity, the significance of the maximum field strength gradient was recognized. This led to the construction of the D-type separator. For both processes, relations between the factors of the raw material and the separation obtained were found. The aptitude of coal dust for magnetic or electric separation can be predicted once these factors are determined. Microscopically determined distribution of pyrite allows forecasts as to the possible removal of this mineral. The values can be completed by measuring the specific gravity. The influence of the medium grain size on the throughput was also determined. An improvement of the sorting results was obtained by the modification of the strong field drum separator type D, in accordance with the new perceptions. (Author abstract modified)

11372 APTIC NO. 29320

Gilbert, G. B.

THE USE OF FLOW MODELING TECHNIQUES TO OBTAIN A MINIMUM LOSS DESIGN FOR THE STACK ENTRANCE SECTION OF A 700-FT POWER PLANT CHIMNEY. *J. Eng. Power, 93(2):192-200, April 1970. 2 refs. (Presented at the American Society of Mechanical Engineers Winter Annual Meeting, New York, Nov. 30-Dec. 3, 1970, Paper 70-WA/Pwr-1.)*

Scale model testing and flow visualization techniques were used to achieve substantial reductions in stack entrance total pressure loss levels. This paper presents the loss coefficient results for three different model configurations for the stack entrance section at the bottom of a 700-ft power plant chimney. For the best configuration, an average stack entrance coefficient of 0.39 was achieved; this represents a reduction of loss coefficient by a factor of 4.5 below the original unvaned design. For the lowest loss configuration, the entrance loss for one or several ducts can be substantially reduced below the other duct entrances by the correct specification of the velocity levels of the joining flow streams at the static pressure matching point. (Author abstract modified)

11373 APTIC NO. 29321

Hara, Jingo and Morikazu Tabata

DEVICE TO CHECK GENERATION OF POSITIVE IONS IN ELECTRIC DUST COLLECTOR. *(Denki shujinki no sei hassei seishi sochi). Text in Japanese. (Mitsubishi Electrical Co., Ltd. (Japan)) Japan. Pat. Sho 45-36960. 3p., Nov. 24, 1970. (Appl. Sept. 3, 1965, claims not given).*

An electric dust collector generates more positive ions than negative. Therefore, the air in a building equipped with an electric dust collector has a higher density of positive ions which is undesirable from a standpoint of environmental hygiene. A device has been designed to check such undesirable generation of positive ions. The device consists of two nets, each serving as an electrode. Both nets are installed at the air discharge side of a two-stage charge type electric dust collector and set at right angles to the air current flow direction. The net closer to the dust collector unit is grounded and the other is charged with high voltage. Between the two nets, an electric field is formed which decelerates positive ions coming with the air current and accelerates negative ions. When air current velocity (V) becomes less than the mobility of the ion times the electric field (E), the positive ions are repelled in the space between the two nets and arrested by the grounded net while the negative ions go out unarrested. Because the working direction of the electric field is from the high-voltage net to the grounded net, the positive ions cannot pass the field to get out of the device. On the other hand, the negative ions move at the speed of (mobility) E + V in the space between the two nets and at the speed of V only after having passed the outer high-voltage net.

11374 APTIC NO. 29322

Dyment, J. and S. E. Smith

THE EFFICIENCY OF AIR FILTERS AND AIR CLEANING DEVICES AND METHODS OF EFFICIENCY TESTING. *Filtration Separation (Purley), 8(2): 158, 161, 162, 164, March/April 1971. 17 refs. (Presented at the Institution of Chemical Engineers and the Filtration Society, Filtration Symposium, London, England, March 18, 1970.)*

Filter efficiency may be quoted in terms of a particular size of particle, or when a range of sizes is present, in terms of weight, numbers, or particles. Discoloration (surface area) efficiencies are also used. The first major group of filters removes submicron particles. High efficiency fibre mat and pleated paper filters are used to trap submicron particles by the diffusion processes. This group also includes electrostatic precipitators and bag filters. The efficiency is generally 99.95% or better on a weight basis. As velocity increases, penetration increases. Efficiency also increases at low concentrations, increased time, and large temperature rises (500 to 1000 C). Techniques to test performance are well advanced. The British use a sodium chloride test, while other countries primarily use the American DOP test. Medium efficiency filters for particles in the 1.0 to 10.0 micron range are frequently used to remove atmospheric dust. Knowledge of efficiency versus particle size is much less than for high efficiency filters. Also, testing is less sophisticated because of the problem of finding a test material which adequately simulates atmospheric contamination. Coarse filters for particles of 10 micron or larger are used for coarse dust collection in devices such as cyclones, venturi scrubbers, and electrostatic precipitators. Although much information about efficiency is known, actual plant operations are the best tests. A number of test dusts are recommended and used by different authorities. Efficiency increases with optimum flow rate, increased particle size, and increased dust concncentration. All three types of filters could use better efficiency standards.

11375 APTIC NO. 29323

Avery, Robert H.

COST EFFECTIVE AIR FILTRATION. *Heating, Piping, Air Conditioning, 43(4):112-116, April 1971. 4 refs.*

Air filtration removes particulate material and gases that may be either odorous or corrosive. Air filters are used to protect mechanical equipment, especially systems involving heating and cooling coils with closely spaced fins, to protect the product, to eliminate duct cleaning costs, and to keep interiors clean. The National Bureau of Standards has established a definition for filter efficiency. Since efficiency is tested by the dust spot method, it is defined by the ability of the filter to remove the staining portion of airborne particulates from atmospheric air. Arrestance is the weight removal of an injected standard dust. Air filters include electronic air filters, roll filters, extended surface filters, and combinations of two filters. Criteria for choosing the proper filter include efficiency, required face velocity, required pressure drop, available in-line space, and required filter life. Also, the owning and operating costs must be considered in the final selection. Because filter requirements change, many filters have the ability to be easily converted. Other ways to reduce air filtration system costs include the use of manometers, prefilters, dynamic loading, and an underrated filter. For reasons of economy and convenience, more emphasis is being placed on the systems approach. Filters can also remove odors; usually acid gas filtration using activated charcoal is most effective. If dust concentrations are too heavy for a filter, a dust collector should be used, except in the case of coarse particles and fibers, where a self-cleaning filter with a vacuum cleaning system may be more economical.

11376 APTIC NO. 29325

Person, R. A.

CONTROL OF EMISSIONS FROM FERROALLOY FURNACE PROCESSING. *J. Metals, 23(4):17-29, April 1971. 20 refs.*

The production of ferroalloys has many dust or fume producing steps, but by far the major pollution problem arises from the ferroalloy furnaces themselves. The conventional submerged arc furnace utilizes carbon reduction of metallic oxides and continuously produces large quantities of carbon monoxide, in many cases in larger amounts than the metallic product. Other sources of primary gas are moisture in the charge materials, reducing agent volatile matter, thermal decomposition products of the raw ore, and intermediate products of reaction. The optimum long range solution is not only the provision of fume collection equipment, but also the adoption of different furnace design and alternate metallurgical processes and operating practices. Process variations, as well as variations with furnace types, are described. The standards by which process emissions will probably be judged pertain to fallout, suspended particulates, visual appearances, and process weight criteria. Raw material selection and treatment are discussed, as well as control equipment and the economics of dust collection.

11377 APTIC NO. 29326

Morrison, Joseph N., Jr.

CONTROLLING DUST EMISSIONS AT BELT CONVEYOR TRANSFER POINTS. *Trans. Soc. Mining Engrs. (AIME), 250(1):47-53, March 1971. 5 refs. (Presented at the Society of Mining Engineers, Fall Meeting, St. Louis, Mo., Oct. 1970, Paper 70B322.)*

The problem of dust emission at belt conveyor transfer points is examined in depth. Belt conveyors emit dust almost exclusively from two points: at the tail pulley where material is received from prior equipment, and at the head pulley where materials discharged. The amount of dust released at transfer points depends upon the physical characteritics of a bulk material and the manner in which the material is handled. Details of enclosure design are discussed and a straightforward procedure for calculating required dust control exhaust volume is presented. Many design variables are taken into account which heretofore have been commonly ignored or inadequately considered. These include belt widths, belt speeds, enclosure openings, material flow rate, material bulk densities, material lump sizes, height of material fall, material temperature, and ambient air temperatures. All of these questions are handled by means of a fill-in-the-blanks type of calculation form, permitting quick, reliable solutions by relative non-experts. (Author abstract modified)

11378 APTIC NO. 29327

Bridgstock, Guy

HOW TO LIMIT SO2 EMISSIONS WITH THE FLASH SMELTING PROCESS. *Eng. Mining J., 172(4):120-123, April 1971. 2 refs. (Presented at the American Institute of Chemical Engineers Meeting, Chicago, Ill., Dec. 1970.)*

While most off-gases from copper smelting operations have a concentration of sulfur dioxide so low as to preclude their use in processes which would permit the recovery of SO2, the Flash Smelting Process can produce a high SO2 content gas stream that can be further treated for SO2 removal by existing chemical methods. Developed by Outokumpu Oy in Finland, flash smelting consists of mixing finely divided dried concentrates with preheated air at the top of the reaction shaft of the furnace in a specially designed concentrate burner. The heat energy released by exothermic reactions of oxidation of the sulfur and iron in the concentrates performs the smelting. These oxidizing reactions continue as the suspended concentrates descend in the shaft of the furnace. The smelted material settles in a molten state in the settler section at the bottom of the furnace as matte and slag while SO2-bearing gases flow out an uptake shaft near the opposite end of the furnace into a heat and dust recovery system. Commercial experience with flash smelting and its advantages are indicated.

11379 APTIC NO. 29328

Rastas, J., E. Nyholm, and J. Kangas

MERCURY RECOVERY FROM SO2-RICH SMELTER GASES. *Eng. Mining J., 172(4):123-124, April 1971. 1 ref.*

When Outokumpu Oy put on-stream its zinc plant at Kokkola, Finland, about half of the mercury contained in the zinc concentrate went to the sulfuric acid produced, and Outokumpu had to find a method for mercury removal from roaster gases. If roasted in a fluidized bed furnace at 950 C, the mercury sulfide contained in zinc concentrates decomposes and the mercury vaporizes. The heat contained in the gases is recovered in a waste-heat boiler. Dust is separated from the gas with cyclones and electrostatic precipitators, and the gases at a temperature of 350 C go to the sulfatizing unit. The mercury sulfatizer is a brick-lined tower containing ceramic packing; here, the mercury-bearing gases are contacted by a countercurrent flow of strong sulfuric acid which sulfatizes the mercury. Sulfuric acid flows from the bottom of the tower to an intermediate storage tank, from where it is pumped through a heat exchanger and recycled to the tower. Part of the acid is taken from the storage tank to a thickener, where mercury sulfate and selenium compounds are separated from the solution. Zinc and iron salts formed from the dust of the gas are also separated from the acid in the thickener. Gas leaving the mercury sulfatizer at a temperature of 180 C contains less than 0.2 mg/cu Nm of elemental mercury. The gas is then washed with weak sulfuric acid in a venturi scrubber to decrease the temperature to about 70 C and to lower the chlorine content to a level permitted for sulfuric acid production. The underflow which is obtained when the mercury and selenium compounds are separated from this weak acid in the thickener is combined with the underflow of the thickener of the mercury sulfatizer. Precipitates from the combined underflow are washed with water. The filtered residue is mixed with lime in a certain proportion, and the batch charged to a resistance-heated furnace whose temperature is raised gradually to about 650 C. The mercury compounds decompose, and metallic mercury vaporized is carried out of the furnace together with an air stream.

11380 APTIC NO. 29330

Ikeda, Hiroshi and Kazuaki Ono

EMISSION CONTROL DEVICES, PRESENT AND FUTURE. *(Haishutsu gasu jokosochi no genjo to shorai). Text in Japanese. Jidosha Gijitsu (J. Soc. of Automot. Engrs., Japan), 25(3):260-266, March 1971. 18 refs.*

Automotive emission control methods available or being developed are presented and classified into five basic categories. They include systems in which exhaust gas purification is carried out through modification of the air intake system, by improving inter-cylinder combustion, and by after-burning the gas in the exhaust pipe, a system designed to prevent the blowby gas from being discarded into the atmosphere, and a system designed to prevent gasoline evaporation. An intake air temperature control system is described which has an air cleaner is equipped with a temperature sensor and control valve, that combine to control the intake ratio between hot air and fresh air to hold the temperature of the intake air constant at about 40 C. The dual induction system features the use of a dual induction manifold designed to accelerate the air intake speed and at the same time promote atomization and gasification of the fuel for an improved distribution efficiency and prevention of the manifold from wetting; it is claimed to be effective in reducing hydrocarbons and carbon monoxide without a sacrifice to the maximum power of the engine. The throttle opener system is designed to check HC which increase during deceleration and transmission gear changes. The shape of the combustion chamber, cooling characteristics, valve, timing, and ignition timing are discussed. Air injection, thermal reactors, catalysis, and afterburners are also described. Other systems include the open system, sealed system, and closed systems, canister system, and crankcase storage system.

11381 APTIC NO. 29339

Jager, J.

BEHAVIOUR OF POLYCYCLIC AROMATIC HYDROCARBONS ADSORBED ON SOLID CARRIERS. II. DECREASE OF POLYCYCLIC AROMATIC HYDROCARBONS ON CARRIER DURING THEIR EXPOSURE TO UV LIGHT. *(Chovani polycyklickych aromatickych uhlovodiku adsorbovanych na pevnych nosicich. Cast II. Ubytek polycyklickych aromatickych uhlovodiku na nosici behem ozarovani ultrafialovym svetlem). Text in Czech. Cesk. Hyg. (Prague), 16(1):14-20, 1971. 16 refs.*

During exposure to UV light, the concentration of some polycyclic aromatic hydrocarbons adsorbed on solid carriers decreased. Carrier fly ash from a power station s electrostatic precipitator was used. Intensity and spectral composition of light were used independent of the hydrocarbon. During continual exposure to UV light, polycyclics on the carrier without combustible matter decreased rapidly in the first hours of irradiation; after a certain time, the decomposition stopped or carried on very slowly with further irradiation. The decomposition rate of polycyclic hydrocarbons decreases with increasing number of benzene rings in the molecule and also depends on their annellation. Hydrocarbons decrease very little on the carriers containing higher contents of carbon, after 32 hours of irradiation by the light of 365 nm wavelength. Pyrene concentration decreased substantially during UV irradiation only on the fly ash with 2% carbon.

11382 APTIC NO. 29350

Ishii, Takeshi, Isamu Shimada, and Masaru Shioyama

STUDIES ON THE ENGINE STATE AND DISCHARGED GAS - MAINLY ON THE EFFECTS OF THE CYLINDER OVER SIZE AND THE PISTON RING STRAIN ON THE BLOW-BY GAS. *(Kikan no jotai to haishutsu gasu ni kansuru kenkyu - Shutoshite shirinda no obasaizu, pisutonringu choryoku to burobaigasu ni tsuite). Text in Japanese. Kikai Shikenjo Shiryo (Bull. Govt. Mech. Lab.), no. 57:1-38, March 1970. 10 refs.*

The generation state and ingredients of automobile blowby gas were investigated in relation to engine adjustment. A one-cylinder gasoline engine and a real automobile engine were used in the experiments. On the one-cylinder engine, cylinder liners of standard size and of four grades oversize were used. The cylinder liner of 0.29 mm oversize was on a boarder line, and the blowby gas quantity increased abruptly when the cylinder liner size became larger. Bench tests of the real automobile engine were performed under the conditions of standard state engine and of an 0.25 mm oversized cylinder liner to measure the blowby gas in cases of normal size or oversize piston and piston ring. It was necessary and effective to use an 0.25 mm oversized piston and piston ring in case of an oversize 0.25 mm cylinder because of the auto exhaust. Using the same automobile engine, if the piston ring strain was within the standard value, the effect by the difference of the strain was little. But, the case of the standard s center value showed the best results. If the strain value went down below the standard, the blowby gas quantity increased abruptly. Also, it is necessary to use the piston ring within the standard from the nuisance control point of view. Because of easy measurement, the gas ingredients were measured using Kitagawa s detector tube; the measured values were a little rough, except the case of carbon monoxide and dioxide.

11383 APTIC NO. 29354

Kanbara, Amane

TECHNOLOGY OF TREATMENT OF CHEMICAL INDUSTRIAL WASTES. *(Kagaku sangyo haikibutsu no shori gijuts). Text in Japanese. Preprint, Japan Chemical Society, Tokyo, p. 225-231, 1971. 8 refs. (Presented at the Japan Chemical Society, Annual Meeting, 24th, Tokyo, April 1-3, 1971, Paper 23.)*

The manufacture of lubricating oil produces sulfuric acid pitch during the H2SO4 washing down and the refining with clay. The sulfur bottom, accumulated at the bottom of the tower for refining styrene monomer is another problem. Something both cheap and effective is needed to replace H2SO4. In organic synthesis, the yield varies depending upon the solvents. Also the by-product separation from the waste solvent, and its recovery present problems. Although DMF and THF are good solvents, their recovery is difficult. Recently, polypropylene and polyurethane can separate oil and plasticizer of less than a few hundred ppm. Adding fluoride to waste water destroys the oil drops. They are separated by electrolysis. Polyethyleneglycol can eliminate small amounts of mercury in water. Because of the small scale of the plastic industry, proper measures for the disposal of waste plastic cannot be taken. New production methods are needed which will not produce so much waste. A new production method for aluminum must be found which will improve energy efficiency. A heat exchanger of fluoric resin has improved heat balance. The gas turbine, rotary engine, and an incinerator which can burn in liquid, will be developed to improve energy efficiency in chemical production processes. Energy can also be saved by improvements in molding, process, production machines, and rolling oil. Combined industries which utilize each other s by-products could limit wastes. Twenty percent H2SO4 soda liquid from the H2SO4 gas of thermal generation stations, can be supplied to the neighboring pulp mills. Iron sulfate from a tatan white factory can burn by the H2SO4 method and pitch from a lubricating oil factory can be mixed and burned, to recover oxidized iron and H2SO4 gas. More factories worry about acidic wastes than alkali wastes. Electronic computers must be adequately used to dispose of inaccurate and unnecessary information.

11384 APTIC NO. 29356

Burnett, Thomas E.

SPRAYED FILTERS A PRACTICAL APPROACH TO AIR CLEANING. *ASHRAE (Am. Soc. Heating, Refrig. Air-cond. Engrs.) J., 13(4):48-50, April 1971. 3 refs.*

Filter selection generally considers the dust arresting efficiency, amount of dust the filter will hold before its resistance to airflo is too great, the initial and final resistance to airflow, costs, maintenance, fire resistance, and the dimensions of filter and spac available. Usually, filters of a higher efficiency than the situation demands are selected for ventilation. Atmospheric dust varies in concentration and particle size; most dust ranges from 0.1 to 20 micron in diameter; the smaller the size, the greater the number of particles. Half the total bulk of particulates have diameters above 1.5 micron and approximately 30% of the bulk is above 2.5 micron. Gaseous pollutants endanger health as gas and as smog, but no media filter, however effective on aerosols, effects gases. Sprayed media filters, however, remove at least some of the gaseous pollutants. Also, the air resistance is low, dirt does not build-up so the resistance remains constant, the filters do not nee frequent replacement, and efficiency of some filters increases. Water requirements vary for different pollutants: 0.18 ppm sulfur dioxide needs 0.006 gal for each 1000 cu ft of air; 0.15 nitrogen dioxide needs 0.1 gal water/1000 cu ft of air; 29 ppm of carbon dioxide needs 1.07 gal for each 1000 cu ft of air. A 0.1 gal draw-off for each 1000 cu ft of air is more than adequate to maintain the spray water in good useable condition, provided the make-up water is of drinkable quality.

11385 APTIC NO. 29360

Farthing, J. Guy

EW STATUS REPORT: SO2 REMOVAL SYSTEMS. *Elec. World, 175(10):34-39 May 15, 1971.*

Because low-sulfur fuels are in short supply and also because of th unfavorable economics of removing sulfur from coal prior to combustion, current industrial research and development work is concentrating on controlling sulfur dioxide emissions by stack-gas cleaning. The gas-cleaning methods can be categorized as either throw-away or by-product recovery systems. The bulk of the former systems are represented by the three basic limestone processes: limestone-injection/dry removal, limestone-injection/we scrubbing, and limestone-add-on/wet scrubbing. The first two systems inject the limestone into the boiler, the last introduces i into the process at the scrubber. The major problem areas of the limestone processes remaining to be solved include potential plate- out, caking, or plugging of the limestone-based materials. An even more serious question is the possibility of ground-water contamination. By-product recovery systems range from those borrowing the technology of the limestone processes to the most chemical advanced dry processes. Among the systems whose current status are noted are UOP, Chemico/Basic, Cat-Ox, Wellman-Lord, Stone and Webster Ionics, B and W Esso, Formate, and Atomics International. Capital costs for the dry limestone process are estimated at $10-$15/kw, with about one mill/kwhr operating costs. Wet limestone processes are estimated to cost $20-$30/kw or higher, with operating cost of 1-1/2-2 mills/kwhr. Most of the advanced chemical systems have higher capital costs, with attendant higher operating costs. Factors mitigating against the recovery systems are the competitive and regional nature of the sulfuric acid market and the fact that many local codes will require both SO2 removal systems and low-sulfur fuels.

11386 APTIC NO. 29361

Linden, Henry R.

A REASSESSMENT OF THE PROSPECTS FOR COAL GASIFICATION. *Coal Age, 76(5):73-79, May 1971. 15 refs.*

For gas to continue to supply a major portion of its present share of the energy market, large-scale production of synthetic pipeline gas from coal will be required in addition to conventional sources. By 1990, when primary energy consumption will probably be at least 150 quadrillion Btu, gas demand could be as high as 42-43 trillion cu ft, and corresponding gas requirements from lower 48 state production 45-46 trillion cu ft. Optimistic estimates of allowable lower 48 production at that time range from 15-20 trillion cu ft. To meet the anticipated deficiency with synthetic pipeline gas from coal would require 1200 million tons of coal above the 800-900 million tons which will be required by 1990 to meet conventional domestic needs. While this goal is unrealistic, it does seem feasible to achieve production of 5 trillion cu ft of synthetic pipelines gas by 1990. This production would require 300 million tons of coal/hr and an aggregate investment for plant and mines of about $12 billion on the basis of 1971 costs. Also necessary is an immediate step-up in development of necessary technology so that demonstration plant programs could begin no later than 1973 or 1974; this would permit second generation plants to go on stream by 1980. The current status of new coal gasification processes for production of synthetic pipeline gas is reviewed, as is a typical purification scheme for the raw gas. (Author conclusions modified)

11387 APTIC NO. 29362

Nakajima, Fumito and Masato Takeuchi

CATALYSTS FOR PURIFICATION OF AUTOMOBILE EXHAUST GAS. (II). CONTACT REDUCTION BY CO AND C3H8 OF NO. *(Jidosha haiki gasu jokayo shokubai. (II). NO no CO oyobi C3H8 ni yoru sesshoku kangen). Text in Japanese. Preprint, Japan Chemical Society, Tokyo, 1p., 1971. (Presented at the Japan Chemical Society, Annual Meeting, 24th, Tokyo, March 1971, Paper 3339.)*

The most effective elimination method for nitric oxide is contact reduction using a catalyst. Most of the NO contained in automobile exhausts turns into N2 and becomes harmless, by contact reduction with carbon monoxide. The behavior of the contact reduction of NO by CO and propane and catalysts with an alumina carrier was examined. The catalysts used were copper oxide and platinum with porous alumina as a carrier. In reduction reaction by CO, the effect of the coexistence of oxygen was also examined. The change in concentration of every component gas with the change in temperature of the catalyst was measured by infrared spectrometry. When O2 did not coexist, the copper oxide catalyst showed a better activation than platinum. The reaction started at less than 100 C, and at 400 C, NO was completely changed to N2 and rendered harmless When O2 was present, NO was reduced with the remaining CO. However, when O2 exceeded the equivalent amount, CO oxidation proceeded so that CO became CO2 and contact reduction of NO by CO did not occur. Nitrogen dioxide was not generated when O2 did not exist, but the amount of generation increased with increased O2. When nitrous oxide was generated, irrespective of the existence of O2, the amount decreased with an increase in O2. Nitrous oxide generation by oxidized copper catalysts was less than for platinum. For the contact reduction of nitric oxide by C3H8, the reaction started at 250 C, slightly higher than the reduction by CO.

11388 APTIC NO. 29363

Fattinger, V.

CLEANING OF WASTE AIR FROM CHEMICAL PLANTS THROUGH SCRUBBING WITH VARIOUS FLUIDS. *(Reinigung von Abluft aus Chemie-Werken durch Gaswaesche mit verschiedenen Fluessigkeiten). Text in German. Chem. Ing. Tech., 43(7):426-431, 1971. 11 refs.*

Chemical plant waste air having a temperature of 15 to 30 C and containing various quantities of acidic vapors, amines, and odorous dusts is cleaned in a scrubbing tower with a height of 9 m and a diameter of 1.2 m. Three scrubbing stages are arranged atop each other; each stage has its own container for the scrubbing fluid, a pump, nozzles, and return pipes. On intermediate floors are 10 circular gas inlets with a diameter of 20 cm. The ring stacks rise above these openings. Diluted sulfuric acid is injected into the gas flow. The mixture of atomized sulfuric acid and gas flows through the apertures ir the ring stacks. Above the ring stacks, nozzles for a downwarc directed jet flow are installed. The total injected volume o scrubbing fluid at each stage is 3 cu m/1000 cu m gas. Afte scrubbing with sulfuric acid, the gas flows to a droplet separator and to the second stage where it is scrubbed with sodiun lye. The scrubbing fluid at the third stage is selected according to the type of dirt in the gas. Usually 3% hydrochloric acid suffices to obtain an odorless gas. The total pressure loss between inlet and outlet of the scrubber is 550 kg of force per square m. One ring stack consists of 30 to 50 rings. Through deflection over the hairpin-like edges of the rings, an intense contact between scrubbing fluid and dirt in the gas is achieved.

11389 APTIC NO. 29366

Harima, Mikio

PREVENTION OF SO2 POLLUTION--WASTE GAS TREATMENT OF SULFUR RECOVERY PLANT. *(SO2 niyoru taiki osen no taisaku - iou kaishu sochi hai gasu shori ni tsuite). Text in Japanese. Kagaku Sochi (Plant and Process), 12(11):35-44, Nov. 1970.*

Air pollution is becoming a serious problem in many countries. One of the general pollutants is sulfur dioxide, which is produced by the combustion of sulfur-containing fuel and whose control requires enterprises to invest large amounts on desulfurization processes. A sour gas process in an oil refinery is an example of a pollution problem and pollution prevention systems. The quantity or the concentration of sulfur dioxide from a sulfur recovery plant varies with the design of the plant and the concentrations of the acid gas treated. The ground level concentration of sulfur dioxide is regulated by law or ordinance in many places, and the desirable stack height is determined by the equations of air pollution. For reducing the concentration of sulfur dioxide in the tail gas of a sulfur recovery plant, an improved Claus process can be used in conjunction with a second process. Although many processes have been tried, there is no successful example, in terms of costs and reliability, of a combination method. Among combination methods are washing with ammonia solutions, a hydrogen-sulfide eliminating process by catalyst, a sulfuric-acid producing process, and the Sulfreen process. Other processes combine absorption of hydrogen sulfide in alkaline solution with air oxidation. Such processes as the Wellman-Lord SO2 recovery process, IFP method, and Beavon process are likely to be adopted in Japan for desulfurizing flue gases from sulfur recovery plants. For improvement of the capacity of sulfur recovery plant itself, the following points are to be considered: the improvement of gas-washing process, the addition of more reactors, careful process control, and reheating of process gas.

11390 APTIC NO. 29368

Yamaguchi, Takaaki

FUTURE TREND IN DESULFURIZATION EQUIPMENT. *(Datsuryu sochi no knogo no doko). Text in Japanese. Seikyu Gakkai Shi (J. Japan Petroleum Inst., Tokyo), 14(3):166-169, March 1971.*

Of 14 desulfurization units were installed since Oct. 1967, only 32% of the total equipment belongs to the direct desulfurization method. The development of catalyst is not fully solved and direct desulfurization is more costly than indirect methods, both in construction and operating costs. A problem in desulfurization faced by the oil industry is the life of catalyst (for the direct method, 0.5-1.0 years, 2-4yrs for the indirect), depending on the kinds and characteristic of the crude oil. The life of catalyst is also shortened if the desulfurization rate is increased and when the sulfur content is less than 0.2%. When the ratio exceeds 0.7-0.8%, its life is prolonged almost indefinitely. In the indirect method, 0.3-0.5% is the economical range. The variable costs of desulfurization equipment are power, catalysts, hydrogen, and chemicals. The costs of catalysts and hydrogen are particularly important; thus the life of the catalyst significantly affects the desulfurization costs. Much of hydrogen raw material is imported, so that the cost of hydrogen is about 50% of the operatin cost. In gasoline reforming equipment by using a platinum catalyst hydrogen is generated which can be used for desulfurization. For 1973, it is indicated that 37,600,000 kiloliters of desulfurized heavy oil will be supplied; this means that there must be a significant increase in desulfurization facilities, a considerable portion of it must use the direct method. Improvements are also needed in the combustion system and in smoke control equipment.

11391 APTIC NO. 29374

Floarea, M. and Gh. Russo

THE PRODUCTION OF SELENIUM AND TELLURIUM FROM THE MUD RESULTING IN THE PURIFICATION OF SULPHUROUS GASES IN THE SULPHURIC ACID INDUSTRY. *Chem. Oil Gas Rom., 7(1):30-37, 1971. 6 refs.*

Processes for purifying sulfurous gases produced by the roasting of pyrites in sulfuric acid plants produce mud containing selenium and tellurium. In laboratory experiments, these compounds were recovered by mixing the dry mud with calcium hypochlorite or lime chloride, cold leaching the mixture to obtain sodium selenite and tellurite solutions, acidulating the alkaline solutions to precipitate TeO2, then separating the precipitate from selenium by reduction with sulfur dioxide. Maximum yields of tellurium (99.00%) and selenium (99.40%) were obtained at a mud:calcium hypochlorite mixing ratio of 5:1. To obtain similar yields by treatment with lime chloride required much lower mixing ratios.

11392 APTIC NO. 29375

Zirna, I.

A NEW METHOD FOR THE PRODUCTION OF LOW SULPHUR-CONTENT FURNACE FUEL BY MEANS OF DELAYED COKING. *Chem. Oil Gas Rom., 7(1):114-128, 1971. 6 refs.*

Experimental results are presented for the desulfurization of high-sulfur fuel oil by coking, with or without recycle, at 440 and 470 C and various working pressures. The highest degree of desulfurization was obtained by coking without recycle and at high pressure. However, the yield of distillates was better, and the sulfur distribution in the gases and in the residue more advantageous, when the coking was carried out at recycle rates of 0.7/l and at 0.5 atm. Under these conditions, which require maintaining a larger percentage of sulfur in the coke, it is possible to achieve up to 30% desulfurization and convenient yields of 200-450 C coking cuts. These cuts have a low viscosity (1.5 deg E/50 deg C). Their use as a diluent for high-viscosity sweet fuel oils permits the production of furnace fuels with good fluidity, excellent thermal stability, and sulfur contents of 1%. The coking gases and the gasoline can be used in known manufacturing processes. Costs of the coking process compare favorably with those of hydrogenation.

11393 APTIC NO. 29387

Kato Jun, Hideo Ose, Morio Suzuki, and Kazuo Shimada

DIRECT DESULFURIZATION OF HEAVY OIL BY CIRCULATION TYPE UPWARD FLOW REACTOR. *(Junkan gata uwamukiryu hannoki ni yoru juyu no chokusetsu datsuryu). Text in Japanese. Preprint, Japan Society of Chemical Engineering, 5p., 1970. 2 refs. (Presented at Japan Society of Chemical Engineering, General Symposium 9th, Nagoya, Japan, Nov. 25-26, 1970, Paper B-3-4.)*

Heavy oil direct desulfurization methods used industrially in Japan include the RCD Isomax process, the Gulf-Residual hydrodesulfurization process, and other fixed-bed types. While the heavy oil fluidized-bed technique solves the problems involving reaction heat control and catalyst life inherent in fixed-bed methods, it increases the quantity of heavy oil recirculation in order to liquefy the catalyst. This results in a near-perfect mixture flow, because the reaction efficiency is lower compared with piston flow. If the old catalyst can be removed from the bottom of a catalyst layer standing still in the upward flow without stopping the operation, it will not be necessary to liquefy the catalyst. And therefore the quantity of heavy oil recirculation can be kept to a minimum, making the flow similar to a piston flow and advantageous for higher reaction efficiency. A moving-bed desulfurization (MDS) process is described in which a stationary layer of spherical pellet catalysts are partially replaced with fresh catalysts fed intermittently while the old catalyst is removed at the bottom. The process permits a higher reaction efficiency due to a lower heavy oil recycle ratio and a small high temperature separator and oil circulation pump due to reduced oil circulation. A larger quantity of catalyst can be put in the reactor, and the fresh catalyst installed from above moves downward as the old catalyst is removed from the bottom so that the new catalyst may be kept in at all times. Since the raw heavy oil flows upward to contact the older catalyst in the bottom of the catalyst, the deleterious substances to the catalyst are first filtered by the older catalyst. A cooling device required for control of the reaction heat, as with the fixed bed type is the main disadvantage.

11394 APTIC NO. 29388

Nakajima, Fumito and Masato Takeuchi

CATALYST FOR PURIFYING EXHAUST GAS FROM AUTOMOBILES. (I). CO OXIDATION ACTIVATION OF METAL OXIDIZED CATALYSTS WITH ALUMINA CARRIER. *(Jidosha haiki gasu jokayo shokubai). (I). Arumina tantai tsuki kinzoku sankabutus syokubai no CO sanka kassei). Text in Japanese. Preprint, Japan Chemical Society, Tokyo, 1p., 1971. (Presented at the Japan Chemical Society Annual Meeting, 24th, Tokyo, March, 1971, Paper 3338.)*

Carbon monoxide oxidation activity was compared using various metal oxide catalysts carried by porous alumina. Each catalyst was sintered at 800 C for 2 hours; its surface dimension ratio (by the N_2 adsorption method) was 160-190 cu m/g. Activation measurements of catalyst were carried out by constant pressure circulation. With program control, reaction temperature fluctuated at a steady rate. Gas concentration was continuously measured with a modified infrared spectrometer. The oxidation reaction speed of CO was proportional to the partial pressure of CO, within the range of less than 40%, and was regarded as a pseudo first order reaction. The relationship between activation energy-E and log A of an indicator factor showed that when E increased, log A increased also. The catalysts with alumina carrier were, in decreasing order of activation, copper, nickel, manganese, chromium, cobalt, iron, and vanadiuu; these differ from MnO_2, Co_3O_4, NiO, CuO, Fe_2O_3 V_2O_5, Cr_2O_3 which are not carried by alumina. This is especially so in the case of cobalt,which, when it is a single oxide, has excellent activation but when it is carried by alumina, is very much inferior. This may be because Co forms a stable aluminate. There was no clear-cut correlation between the various catalyst s activation and their respective metal oxides heat of generation.

11395 APTIC NO. 29391

Baur, Herbert

SAFETY MEASURES AT WET DUST COLLECTORS AT THE TREATMENT OF MAGNESIUM ALLOYS. *(Sicherheitsmassnahmen an Nassentstaubungsanlagen bei der Verarbeitung von Magnesiumlegierungen). Text in German. Staub, Reinhaltung Luft, 31(3):129-132, 1971. 3 refs.*

Two types of wet collectors are used for collecting magnesium dust. The first one, used for waste air quantities of 1000 to 6000 cu m/hr, consists of a collector, ventilator, and sludge collection container. The dust is drawn off at the point of origin and carried by the air stream which is produced by the ventilator, over pipe lines to the collector. The tangential inlet of the collector is spiral shaped and a rotary movement is imparted on the air flow. The particles are thrown against the wall by centrifugal force where they come in contact with the scrubbing fluid (water). The second unit is used for air quantities of more than 4000cu m/hr. Here the dust-laden air mixture enters the wet collector through a nozzle. At the narrowest point of the nozzle, water is drawn in by the high speed of the air flow. The safety measures at these collectors include a high-speed exhaust system for rapidly drawing off the dust. All parts of the exhaust system are made of aluminum. The pipelines have openings covered by aluminum foil which give way in the case of an explosion to release the pressure. For safe and efficient operation of the wet collectors it is necessary to maintain a constant air quantity and thus a constant flow speed, as well as an adequate water level.

11396 APTIC NO. 29393

Poetschke, Herbert

MODERN FILTERS FOR MANY PURPOSES. *(Moderne Filter fuer viele Zwecke). Text in German. Wasser, Luft, Betrieb, 15(4):138-142, 1971.*

A new adsorption-oxidation unit has been developed for the removal of low and high concentrations of vaporous pollutants from the air. The adsorption equipment, consisting of an activated coal filter, is equipped for filter regeneration and catalytic combustion of the adsorbate. The heat liberated at combustion is used for adsorption, thus no costs for energy arise. One version of the unit is illustrated wih an air flow of 2000/cu m. The adsorber contains about 100 l activated coal and can be loaded with a maximum of 20 kg organic substances. At a pollutant concentration of 500 mg/cu m, filter regeneration becomes necessary only after 200 operating hours. The wet and dry electrostatic precipitators manufactured by EWK-Zschoze Kaiserslautern have been improved. Through additional collectors, the collection efficiency of the filter has been increased without enlargement of the filter. A new waste gas cleaning unit for cupola furnaces operates on the venturi principle. It has just one saturator, for two cupola furnaces operated alternately which saturates and cools the waste gases to the dew point. A new plate shaped precious metal catalyst has been developed. It has a low pressure loss and can be highly loaded.

11397 APTIC NO. 29397

Coste, Jean, Maurice Momtat, and Jean Mahenc

POTENTIOMETRY IN A MOLTEN MIXTURE OF POTASSIUM SULPHATE AND DISULPHATE. APPLICATION TO THE CATALYTIC OXIDATION REACTION OF SULPHUR DIOXIDE ON VANADIUM PENTOXIDE. *(Potentiometrie dans le melange sulfate-disulfate de potassium fondus: application a la reaction* *catalytique d oxydation du dioxyde de soufre sur pentoxyde de vanadium). Text in French. Bull. Soc. Chim. France, 11(3):767-772, March 1971. 19 refs.*

The behavior of several vanadium compounds, at different oxidation levels, is studied in a potassium sulfate-disulfate melt. The determination of the molar ratio V(V)/V(IV) is achieved using a zero intensity potentiometric method. Thus, it is possible to follow the kinetics of the reaction between vanadium pentoxide and sulfur dioxide or between vanadium oxysulfate and oxygen.

11398 APTIC NO. 29402

Strauss, W.

INTRODUCTION. TO WHAT EXTENT MUST GASES BE CLEANED? BASIC DATA REQUIREMENTS. *In: Industrial Gas Cleaning. The Principles and Practice of the Control of Gaseous and Particulate Emissions. New York, Pergamon Press, 1966, Introduction, p. 1-6; Chapt. 1, p. 7-26; Chapt. 2, p. 27-61. (For references, see 29405.)*

The two fundamental reasons for cleaning gases in industry are profit and protection. The basic mechanisms employed are gravity separation, centrifugal separation, inertial impaction, direct interception, Brownian diffusion, eddy diffusion, thermal precipitation, electrostatic precipitation, magnetic precipitation, Brownian agglomeration, and sonic agglomeration. Before a suitable plant can be recommended and designed, the gas flow rate, gas temperature, gas composition, nature of the material to be removed, and the degree of removal required must be known. The harmful concentrations of pollutants, ground level concentrations from elevated point source emissions, and geographical factors in air pollution control are discussed. Air pollution control legislation in the United Kingdom, United States, U.S.S.R., Germany, France, Holland, Belgium, and Canada, Sweden, Denmark, Italy, Australia, and New Zealand is reviewed and basic data requirements for the determination of gas flows, gas temperature, dew point, and samplin classification are described. The collection and analysis of gases isokinetic sampling, sample collectors, and volumes are given. Size analyses based on particle geometry and particle analyses based on aero and hydrodynamics are discussed, and average particl size based on surface area and other methods for particle sizing are also presented.

11399 APTIC NO. 29403

Strauss, W.

THE REMOVAL OF A GASEOUS CONSTITUENT: ABSORPTION, ADSORPTION AND COMBUSTION. FLUID RESISTANCE TO PARTICLE MOTION. GRAVITY AND MOMENTUM SEPARATION EQUIPMENT. *In: Industrial Gas Cleaning. The Principles and Practice of the Control of Gaseous and Particulate Emissions. New York, Pergamon Press, 1966, Chapt. 3, p. 62-121; Chapt. 4, p. 122-143; and Chapt. 5, p. 144-159. (For references, see 29405.)*

The three methods of removing gaseous constituents from flue gases are absorption in a liquid, adsorption on a solid surface, or a chemical change into a harmless gas, usually by combustion. The molecular diffusivity is calculated, and a film theory of absorption and the design of absorption systems in presented. Gas absorption processes are described for sulfur dioxide, fluorine and fluorine compounds, chlorine and chlorides, hydrogen sulfide, and nitrogen compounds. The adsorption of gases on solids and the combustion process of flame combustion and catalytic combustion are explained. The calculation of the fluid resistance to the cross-stream movement of the particle is essential in determining the effectiveness of a particular mechanism in removing the particle from the gas stream. The calculation of the resistance of a fluid to the movement of particles when these are acted on by forces outside the fluid are discussed. The simplest method for removing particles from a moving gas stream is to allow them to settle out under the force of gravity. Momentum separators rely essentially on producing a sudden change of direction in the gas stream. The theory of settling chamber design and applications of simple settling chambers are described. Momentum separators are more complex but take up less room and are able to collect particle down to about 20 microns with reasonable efficiency.

11400 APTIC NO. 29404

Strauss, W.

CENTRIFUGAL SEPARATORS. THE AERODYNAMIC CAPTURE OF PARTICLES. *In: Industrial Gas Cleaning. The Principles and Practice of the Control of Gaseous and Particulate Emissions. New York, Pergamon Press, 1966, Chapt. 6, p. 160-213; Chapt. 7, p. 214-243. (For references, see 29405.)*

Cyclones, the name for collection systems where particles are removed from spinning gases by centrifugal forces, are probably the most common dust removal systems used. They are simple to construct and have no moving parts. There are no temperature limits and maintenance can be reduced to a minimum. The centrifugal force on particles in a spinning gas stream is much greater than gravity; therefore cyclones are effective in the removal of much smaller particles than gravitational settling chambers and require much less space to handle the same gas volumes. On the other hand, the pressure drop in a cyclone is greater and power consumption is much higher. Straight-through cyclones with fixed or moving impellers, centrifugal fan cyclone separators, conventional (reverse flow) cyclones, commercial cyclones, and cyclones in series are described, and cyclone performance and pressure drop are predicted. The collection of particles by fibrous filters and liquid scrubbers is essentially the capture of particles by collecting bodies. The gas stream passing through the filter or scrubber takes the particles close to the collecting bodies and then a number of short range mechanisms accomplish the actual collection; these mechanisms include inertial impaction, interception, and diffusion. Mathematical models are developed for each individual mechanism, and solutions are generally obtained by numerical methods. The combination of two or more short range mechanisms was not attempted on a comprehensive basis, but numerical solutions were found for some special cases.

11401 APTIC NO. 29405

Strauss, W.

FILTRATION BY FIBROUS FILTERS. PARTICLE COLLECTION BY LIQUID SCRUBBING. ELECTROSTATIC PRECIPITATION. SUNDRY METHODS AND MECHANISMS IN PARTICLE COLLECTION. *In: Industrial Gas Cleaning. The Principles and Practice of the Control of Gaseous and Particulate Emissions. New York, Pergamon Press, 1966, Chapt. 8, p. 244-296; Chapt. 9, p. 297-335; Chapt. 10, p. 336-396; Chapt. 11, p. 397-422. 553 refs. (Chapt. 1-11.)*

In general, fine fibers are more effective collectors than coarse ones because of their larger inertial impaction and interception parameters, as well as their provision of a larger aggregate surface area per unit volume for diffusion to take place. Closer packing of the fibers also tends to improve collection because of favorable fiber interference effects. The collection mechanisms in scrubbers are the same as in filters; inertial impaction, interception, and diffusion. In addition, condensation effects and particle entrainment may play an important part in collection. Electrostatic precipitators are applied wherever large volumes of gases have to be cleaned and there is no explosion risk. The plants are used for fly ash collection in modern base-load pulverized-fuel-fired power station boilers and for the collection of dust in the cement industry. Precipitators are also used for large scale fume collection systems in the metallurgical industry, for the collection of particles and mist droplets in the chemical industry, and for dust removal in air conditioning systems. Theories of agglomeration and thermal precipitation are outlined and the extent of their commercial exploitation is discussed. Other aspects of particle mechanisms such as the movement of charged particles in magnetic fields are mentioned briefly since they may lead to future developments in particle separation techniques.

11402 APTIC NO. 29406

Scott, J. W.

CRC RDS ISOMAX PROCESS. *(CRD RDS Isomax purosesu). Text in Japanese. Seikiyu Gakkai Shi (J. Japan Petroleum Inst., Tokyo), 14(3):170-174, March 1971. 6 refs.*

The reduced hydrodesulfurization process has succeeded in an industrial scale for distillate. However, direct desulfurization of residual oil has many problems for the metals and asphaltene contained in it. Indirect desulfurization of residual oil, from which asphaltene is eliminated is reliable, and four plants are in operation in Japan. The theory, process, operational data, yield, and economy of this process are given. The desulfurization reaction is second order. The desulfurization cost rises with the content of sulfur not only in the oil but also in the asphaltene. Activity reduction of the catalyst is caused by the accumulation of metals and coke on the catalyst body. The adoption of graded catalyst bed improves operation. The solid bed was used as the reaction system for good thermodynamic efficiency, easy operation, and ability of graded catalyst. The reaction pressure does not affect the operating costs although desulfurization power is affected by the production of coke in a low-temperature range. The consumption of hydrogen was improved in this process, and is the same as in light oil desulfurization. This process is operated in the range of 650-750 F with a middle pressure. A guard reactor is installed for the desulfurization reactor to balance the reaction of desulfurization and demetalization. Operational data to produce 1% sulfur oil from 3% residual oil (pilot plant) shows the effect of a graded catalyst, which has a life 1.5 times that of a conventional catalyst. Metal precipitates, reaction temperature, and pressure loss are improved in this process. High temperature operation is not economical because of the high rate of consumption of hydrogen. The RDS isomax is the most economical process fo/ the Middle East residual oil with a wide range of desulfurization.

11403 APTIC NO. 29413

Inamura, shiro and Akira Sasa

PROBLEMS IN HEAVY-OIL DESULFURIZING EQUIPMENT. *(Juyu datsuryu sochi kosei kiki ni okeru sho mondai). Text in Japanese. Nippon Kikai Gakkai Shi (J. Japan Soc. Mech. Engrs., Tokyo), 74(626):278-286, March 1971. 21 refs.*

In recent years, the sulfur dioxide air pollution has become a serious problem in Japan. Most of the petroleum refining plants have constructed heavy oil desulfurizing equipment for the prevention of air pollution. Each desulfurizing system adopts the hydrogenating method used for the desulfurizing of gasoline, kerosene, light oil or lubricating oil. However, since the heavy oil desulfurizing equipment is operated at high temperatures and high pressures, and since it has to be large enough to deal with large scale treatment, it has many more problems than light oil, such as the selection of construction materials, design, and maintenance. Specifically, the problems in the heavy oil desulfurizing equipment are corrosion, large scale equipment, increased leakage possibility, and increased vibration and noise. Hydrogen sulfide, hydrogen, ammonia, chlorine anion, and cyanogen anion cause corrosion. Because heavy oil contains more H2S and NH3 than light oil, and the heavy oil desulfurizing requires high temperatures and high pressure, many problems occur with the selection of construction materials. The problems are investigated, considering each factor and its effect. Large scale treatment, high temperatures, and high pressur require large, thick-walled devices. Also, large scaling and high pressurization of reaction chambers and pressure still cause problems.

11404 APTIC NO. 29414

Stoefen, Detlev

WHICH FUEL WILL REPLACE LEAD-CONTAINING GASOLINE? (Welcher Autotreibstoff wird das verbleite Benzin abloesen?). Text in German. Staedtehygiene (Uelzen/Hamburg), 22(4):88-91, 1971. 12 refs.

Alcohol olefins and aromatic hydrocarbons such as benzene, toluene, and xylene could theoretically be used as antiknock agents instead of the toxic tetraethyl lead. Alcohol slightly increases the antiknocking property. Olefins are good antiknock agents but more expensive than gasoline. Both substances pose little danger to human health. Aromatic hydrocarbons, however, are extremely hazardous. Much higher quantities than tetraethyl lead must be mixed with gasoline. In the Federal Republic of Germany, the tolerance limit for long-term emission concentrations for benzene is 3 mg/cu m; for toluene and xylene, 20 mg/cu m. The Soviet Union has set a maximum emission concentration limit of 0.8 mg/cu m for benzene. Tests on 5 persons showed that a benzene vapor concentration increase from 1.5 to 2 mg/cu m, a toluene vapor concentration increase from 0.6 to 1.0 mg/cu m, and a xylene vapor concentration increase from 0.21 to 0.32 mg/cu m suddenly changed the electroencephalogram. The potentials dropped in the case of benzene and toluene and rose in the case of xylene. The addition of aromatics to gasolines is not tolerable because of their toxicity. Exposure of female rats to 1 mg benzene/cu m changed their pregnancy duration, and affected the number and health of the newborn rats.

11405 APTIC NO. 29417

Ariga, Hajime, Hiroshi Sugiyama, Keijiro Kinoshita, and Sadaharu Kakazawa

FUTURE POSSIBILITIES FOR REMEDIAL MEASURES AGAINST PUBLIC NUISANCE CAUSED BY MOTOR VEHICLES. *(Jidosha no kogai taisaku no bijon). Text in Japanese. Jidosha Gijutsu (J. Soc. Automot. Engrs. Japan), 25(3):228-236, March 1971.*

Control measures enacted or suggested to combat air pollution from automotive emissions are discussed. With the gasoline engine, carbon monoxide and hydrocarbon emissions are minimized and nitrogen oxides maximized at an air/fuel ratio of 15-17. A control device can be installed on the engine s intake side in the engine proper (combustion chamber), and on the engine s exhaust side. Measures to check blowby gas include the open sealed, and closed systems. For HC gas evaporating from the fuel system, the crankcase storage system and canister system are available. Dust discharged from the engine can be prevented by lowering the compression ratio, delaying the ignition timing, and changing the material of the exhaust valve seat if lead-free fuel is used. The problems likely to occur in an engine equipped with available techniques and devices such as air injection, thermal reactors, and afterburners are discussed. Future automobiles being developed or conceived as pollution-free include the vapor engine automobile, gas turbine automobile and electric automobile, their performance characteristics advantages, are considered. Emissions from the vapor engine and the gas turbine are compared with those from the gasoline engine. For the electric automobile, conventional, new, and fuel-type batteries are discussed.

11406 APTIC NO. 29422

Mayer, F. X. and W. J. Baral

ESSO/UNION HYDRODESULFURIZATION PROCESSES. *(Esso/Union juyu suisoka datsuryu purosesu). Text in Japanese. Seikiyu Gakkai Shi (J. Japan Petroleum Inst., Tokyo), 14(3):175-180, March 1971.*

Two types of fuel oil desulfurization processes, GO-fining and Residfining are discussed. GO-fining is a process which almost completely desulfurizes reduced pressure light oils and similar oils. In residfining, fuel oil containing less than 1% wt sulfur is produced by treating atmospheric residual oil and deasphalting oil. The two processes differ in the severity of operation and the desulfurizing rate. The applications and costs are compared. A special catalyst is required for hydrotreatment to maintain the catalytic activity for a long period; the RT-2 catalyst is used for this purpose in the residfining process. The desulfurization rate of the pooled fuel oil is usually 45% for GO-fining, and 60-75% residfining for GO-fining is employed when the required desulfurizing rate is comparatively low or sulfur is less than contained in the oil. The RT-2 catalyst has an ability to refuse the asphaltenes.

11407 APTIC NO. 29424

Sterba, M. J.

HYDROSULFURIZATION OF FUEL OIL BY ISOMAX PROCESS. *(Isomax purosesu ni yoru juyu nenryoyu no suisoka datsuryu). Text in Japanese. Sekiyu Gakkai Shi (J. Japan Petroleum Inst. Tokyo), 14(3):190-194, March 1971. 3 refs.*

Emphasis on the development of the catalyst used in hydrodesulfurization resulted in a technique is called the RCD Isomax process (Reduced Crude Isomax Desulfurization Process). Direct and indirect desulfurization processes are explained briefly; direct hydrodesulfurization processes such as the RCD Isomax must be employed to meet regulations. Desulfurization of residual oil is far more difficult than that of the distillate. Several residual oils were treated in the pilot plant, and the effects of operating parameters on the reaction rate of hydrodesulfurization and the ability and stability of the catalyst were tested. The sulfur balance in the residual oil and the product showed the high capability of the catalyst. Optimal operating variables were determined at the pilot plant. Some examples of practical use are described for the RCD Isomax process and UOP indirect desulfurization process. The possibility of improving the process is discussed with regard to the catalyst, elimination of hydrogen sulfide from the circulating gas, and the cooling of the reactor.

11408 APTIC NO. 29425

Tatematsu, Kenzo, Kimitaka Kansaki, and Jiro Moritsugu

DUST-COLLECTING ELECTRODES OF ELECTRIC DUST COLLECTOR. *(Denki shujin sochi no shujin denkyoku). Text in Japanese. (Matsushita Electric Co., Ltd. (Japan) Japan. Pat. Sho 45-41559, 3p., Dec. 26, 1970. (Appl. Nov. 10, 1964, claims not given).*

The present invention offers a compact arrangement of dust-collecting electrodes that will contribute to weight reduction of an electrostatic precipitator and make its maintenance easier are described. The overall construction resembles that of a paper condenser. At the center or core is a winding frame around which both the positive and negative film strips are wound alternately. The positive electrode is a film strip made of insulation material but coated with a foil of conductive material, except for some portions along both side edges of the strip. These nonconductive side edge portions are corrugated and fitted with spacers. The negative electrode is a plain strip of metal made as wide as the positive electrode strip. Both the positive and negative electrode strips are then put together and wound around the winding frame. The corrugated side edge portions of the positive strip, together with the spacers, give the necessary spacing between the two electrodes. An electric terminal is provided in the winding frame. The entire electrode setup is housed in a case. An electrostatic precipitator equipped with these new dust-collecting electrodes is operated exactly in the same manner as is any other electrostatic precipitator. This compact design of the electrode unit permits construction of a light weight electrostatic precipitator and easy replacement of the electrode unit for cleaning.

11409 APTIC NO. 29429

WET COLLECTOR WITH VENTURI NOZZLES. NOVEL DUST COLLECTOR. *(Nassabscheider mit Venturiduese. Neuartiger Luftstaubsammler). Text in German. Wasser, Luft Betrieb, 15(4):A35, 1971.*

A new cylindrical wet collector is described. The ventilator, the dust collector, as well as the water and sludge container, are united in one casing whose interior is accessible through large doors. The pollutants are collected in several stages. The first stage is formed by a wet cyclone. The dust-laden gases enter the scrubber tangentially and pass an atomized water zone. A large amount of dust is collected at this stage through wetting and centrifugal force. The precleaned gas then passes the centrically arranged venturi nozzles. Here the wetted gas mixture is accelerated, simultaneously water is injected via an annular slot. In a subsequent diffusor, part of the speed energy is recovered. The separation of gas and water takes place in a centrifugal water precipitator. The water is circulated in the venturi scrubber without pumps. The evaporated water quantity about 30mm/hr must be replenished. The venturi scrubber is suitable for collection of finest dust. Also described is a new dust collector featuring a multistage turbine with a motor (220 V) which permits a throughput of 155 cu m/hr. All conventional types of filter papers can be used. Filter paper with diameters of 185 mm and 100 mm fit. The cooling air for the motor and the measured air are completely separated. The collector is portable and weighs 8.5 kg.

11410 APTIC NO. 29433

Supp, A. and W. Schnuerpel

PHYSICAL METHODS FOR REMOVAL OF PYRITE FROM SOLID FUELS WITH SPECIAL CONSIDERATION OF THE CAGE PRECIPITATION METHOD. *(Physikalische Verfahren zur Abscheidung von Pyrit aus festen Brennstoffen unter besonderer Beruecksichtigung* *des Korbscheider-Verfahrens). Text in German. Tech. Mitt. Krupp, 29(1):35-42, 1971. 15 refs. (Presented at the E.C.E. Symposium Entschwefelung von Brennstoffe, Geneva, Switzerland, Nov. 1970.)*

The wet processes for coal desulfurization are divided into several methods. Sedimentation machines and cyclones are used to remove non-bound pyrite grains larger than 1 mm. Wet gravitation and centrifugation is used to separate 1 to 0 Omm sized grains. Cage precipitators and water cyclones have recently been developed for density decanter centrifuges. The cage precipitator consists of cylindrical containers with a rotating agitator which is the collecting cage for the solid material. The cages consist of individual rings of concave shape or of a cylindrical cage with an upper and lower termination ring. The rotation of the agitator/collection cage causes the suspension to continuously circulate in the external annular space between collection cage and container wall. Centrifugal force makes the solid matter collect on the cage wall. The suspension is passed to the second stage for separation of the residual solid matter. Then the separated material is flushed from the cage with pressurized water. A pilot plant operates according to this method with four twin containers, each with a volume of 22 liters. With this facility, 40 to 60% of the total sulfur content could be removed from suspensions with a solid content of 43 to 60% by weight.

11411 APTIC NO. 29434

Japan Study Group of Demand for Lead and Zinc

PRACTICAL APPLICATION AND POPULARIZATION OF ELECTRIC VEHICLES. *(Denki jidosha no jitsuyoka to fukyu). Text in Japanese. Namari t Aen (Lead Zinc), 8(40):8-27, March 1971. 26 refs.*

Environmental pollution caused by gasoline-fueled automobiles, anti-pollution control standards, auto traffic patterns in urban areas and other relevant factors all point to the need to develop electric vehicles. Those drive power sources claimed to offer pollution-free auto transportation were briefly discussed in terms of anti-pollution characteristics, output density and energy density, and economical merits. They included gas turbine engine, steam engine and rotary engine, for heat engines; lead acid battery nickel-cadmium battery, silver oxide-zinc battery and zinc-air battery, for storage batteries; and H-O battery, hydrocarbon battery, N_2H_4 (hydrazine) battery and high-temperature battery usin sodium carbonate or lithium as electrolyte, for fuel batteries. Practical application and development of electric vehicles abroad, mostly in Great Britain and the U.S.A., were introduced, followed by the discussion of Japan s development activities in this field. Already in 1968, two Japanese battery makers introduced lead acid battery-powered automobiles, one equipped with the battery of 46.2 Wh/kg energy density and the other with that of 55 Wh/kg energy density. The former reportedly succeeded in a test run for 600 km and the latter for 1032 km. Other cases of practical application of electric vehicle included about 300 electric cars used in the 1970 Japan World Exposition Fair. Many development programs are now underway with private enterprises and some governmental agencies including the 5-year program sponsored by MITI (Ministry of International Trade and Industry). The performance of electric automobiles was compared with that of a compact gasoline-fueled vehicle to find that the electric automobil is suitable for urban uses. The advantages, such as low fuel cost, pollution-free operation, and the problems, such as battery life and long charging time, were discussed.

11412 APTIC NO. 29437

Terao, Kunio, Seiji Miyagi, and Takashi Mitadera

EXHAUST GAS PURIFICATION DEVICE FOR DIESEL ENGINE. *(Dizeru kikan n kaiki joka sochi). Text in Japanese. Preprint, Japan Society of Mechanical Engineering, Tokyo, 3p., 1970. (Presented at the Japan Society of Mechanical Engineering Conference, 805th, Tokyo, Japan, Nov. 19-20, 1970, Paper 27.)*

The diesel engine emission gas purifier, developed through a practical application of Core formation theory, is discussed. The purifier consists of an evaporator containing water, a cooling pipe, a condensation water tank and a polyurethane filter. Emission gas discharged from the diesel engine is taken from the exhaust gas pipe into the evaporator, in which the larger carbon particles are removed where water is evaporated with the exhaust gas heat. The exhaust gas, now containing almost saturated steam, goes into the cooling pipe, which is air-cooled with ambient air of 3 m/sec wind velocity blown by an air fan. Cooled in the cooling pipe, the exhaust gas, containing the saturated steam, becomes supersaturated and liquefied. Since core formation of water drops is most likely to take place on surfaces of the carbon particulates during this process, water drops chiefly form on the surface of the carbon particulates which are used as its core. Eve small particulates thus expand with water drops to become larger in size and then go into the polyurethane filter, where they are easily arrested. The exhaust gas, thus removed of the soot and other particulates, is then discharged from the filter into the atmosphere. Measurements made to verify effectiveness of the devic have indicated that: smoke dust removal efficiency is more than 80%; about 70% removal efficiency for sulfur dioxide and bad odor obtained with use of water alone can be increased to 100% when about 0.3% NaOH is added to water; NO_2, NCHO, CH_3CHO, and CO are inclined to decrease but definite confirmation of the decrease was not possible because they existed in extremely small quantities fro the beginning; water consumption is roughly 400 g/ps.h or about twice as much as fuel consumption; and loss in developed power of the engine is negligible. The purifier could be made in a practica sense, in that the one designed for a 10-litre, 190 ps diesel engin was used in an 8-ton dump truck weighed about 170 kgs.

11413 APTIC NO. 29438

FORTY EIGHTH PERIOD POWER COMMITTEE MEETING CONFERENCE ON POWER PLANTS AND POLLUTIONS. *(Doryoku Plant to kogai). Text in Japanese. Nippon Kikai Gakkai-shi, (J. Japan Soc. Mech. Engr., Tokyo), 74(626):269-277, March 1971.*

The conference on power plants and pollution which took place on Nov. 5, 1970, was attended by representatives of many Japanese industries. Outlines of Thermal Generation Industry and Pollution, Desulfurization of Exhaust Gas by Activated Charcoal Method, were given first and policy to prevent air pollution was discussed. The Outline of Environmental Countermeasures taken by the Atomic Energy Power Generation Station was given, followed by a discussion of the overall policies on pollution by power plants. Future power plants and problem of pollution were also discussed. Thermal power generation consumes about 40-45% of heavy oil in Japan. However, the heavy oil used by power generation stations has about 1.6% sulfur content; therefore, power stations are responsible for about 30% of sulfur dioxide emissions. Since they are equipped with high stacks, taller than 150 m, the concentration of SO_2 on the ground will be about 15%. Desulfurization cost per kl of heavy oil, at the rate of 350,000 kW, is around $3.00-$4.20 in the dry method, but in a wet system, washing with lime milk and producing gypsum, it is $1.70-$2.00 kl. Resorting to high sulfur content fue while desulfurizing the smoke will not necessarily reduce the cost. However, if heavy oil with 5.5% sulfur content can be bought at $8.40 kl, the cost of operating a 375,000 kW generation station might be reduced. At Tsuruga Power Station (boiling water type reactor), about 15 m rem is emitted. Zero release system, cold trap of gas by activated coal, and adsorbing rare gas and storing i in bombs are adopted. In the future, more stress will be laid on atomic power generation, reaching double the thermal generation in 1990. Thermal generation s peak, at 130 million kW, will be reache between 1985 and 1990. Pollution by xenon and perhaps by krypton must also be tackled.

11414 APTIC NO. 29441

Snyder, James D. and Robert F. Hickox

DOWNWIND, AKRON STINKS' – II. *Rubber World, 161(4):73-75, Jan. 1970.*

The U. S. rubber industry is now thinking about ecology, since 142 million tons of toxic matter is being emitted into the air each year, health costs run as high as $4 billion each year, and chronic respiratory disease is a result of air pollution. The rubber industry generates at least 1.6 million tons of solid waste a year including discarded tires and spends only 1.6% of its capital on pollution control. Gas-fired boilers, electrostatic precipitators, dust collectors, and smokeless tips on flare stacks are being installed to eliminate smoke and fly ash. Also, new applications are being developed for reclaimed rubber; attempts are being made to recycle more waste back into the production process; and chemica compounds are being extracted from used tires for re-use. Akron s new pilot latex plant is a sophisticated latex waste treatment unit

11415 APTIC NO. 29444

Karnaukhov, N. M.

EFFECT OF A DEFLECTING ELECTRODE IN AN ELECTRIC PRECIPITATOR ON THE CORONA DISCHARGE CURRENT. *Soviet J. Non-Ferrous Metals (English translation from Russian of: Tsvetn. Metal.), 9(10):60-62, Oct. 1968. 2 refs.*

Deflecting the electrode in an electric precipitator effects the corona discharge current. The current was measured at various relative positions of discharge, precipitation, and deflecting electrodes, and at various potentials of discharge and deflecting electrodes. Volt-ampere curves of corona discharge with a 50 deg angle for different electrode clearances were parabolic. The corona discharge current decreases with the electrode gas under stable voltage and with the reduction in the distance between the precipitation and deflecting electrodes. No substantial difference between positive and negative corona discharges were found in the units with deflecting electrodes. The deflecting electrodes create an electric screening field around the discharge electrode and effect the corona discharge, thus reducing the current. Where a deflecting electrode is used, the magnitude of the discharge curren has to be checked and controlled. The screening effect is greater if the voltage at the deflecting electrode is higher and if its distance to the discharge electrode is smaller.

11416 APTIC NO. 29448

Nishida, Konosuke

THE REMOVAL FOR THE STINKING COMPOUNDS BY SPRAYING THE DEODORANT SOLUTIONS (II). *(Dasshu-eki ni yoru shinyo shuki seibun no jokyo n tsuite). Text in Japanese. Akushu no Kenkyu (Odor Research J. Japan), 1(4):21-32, March 1971. 6 refs.*

At the human manure treatment plants, (with 14-300 cu m/day capacity; 30-70.5 cu m tank volume; 14-265 cu m/day charge), solid adsorbents are used to eliminate the odor and to desulfurize. Their effectiveness rapidly decreases after a few days, although at first it was 58-78% effective. Therefore the deodorant effectiveness was tested in a laboratory. Diethylamine, hydrogen sulfide, and ammonia were used as obnoxious odors. When the deodorant was sprinkled over dimethylamine, diluted to 10 times, no amine was detected when the odor source was 800 ppm and 1000 ppm. The detection range was approximately 0.01 ppm. As the odor source is stirred up by rotating wings, and contacts the deodorant, the effectiveness improves greatly. When the deodorant is sprayed at more than 0.85 ml/sec, the odors were eliminated even more efficiently. Hydrogen sulfide and ammonia odors, the main constituents of manure odor, were measured when the source concentration of ammonia was 40 ppm (2.0 cu m/min), 45 ppm (4.7 cu m/min), 50 ppm (2.0 cu m/min), 60 ppm (5.6 cu m/min), and 100 pp (2.0 cu m/min), and the amount of deodorant sprayed at 17.5, 28.0, 50.0, 77.5 and 108.0 g/min. The revolution of rotating wings was 100 ppm. As the ammonia increased, the concentration in the exhaust air decreased to 10-20 ppm, and when the amount of spray reach 108.0 g/min, the concentration in the air decreased to 2.0-4.0 ppm. Irrespective of the source concentration and treated air amount, when the deodorant spray in the air reaches a certain range, the elimination of ammonia is influenced by the time of contact between gas and liquid. The maximum was 2-4 ppm at 13.5- 37.8 sec. With hydrogen sulfide, as the deodorant increased, the concentration of odor in exhaust decreased greatly, but when the spray exceeded 45.0 g/min, the concentration in the exhaust decreased more slowly. When the spray reached 65 g/min, as in the case of ammonia, the concentration of hydrogen sulfide in the exhaust gas became 20-30 ppm, which is the limit of elimination with a 31.5-37.8 second stay in the tank. The masking method is simple to handle, requires a simple device, and causes no change in the deodorizing effect when used continuously. Eleven deodorants were tested. When analyzed, using a PEG column 14-48 peaks were detected, of which 3.16-21.75% were effective elements. The deodorant is stable up to 40 C. The spray method was much more advantageous than other methods.

11417 APTIC NO. 29450

Kanbara, Shu

HIGH POLYMER WASTE DISPOSAL AND TECHNICAL RENOVATION. *(Kobunshi haikibutsu shori to gijutsu kakushin). Text in Japanese. Preprint, Japan Society for High Polymers, Tokyo, 8p., 1971. 8 refs. (Presented at the Symposium of High Polymer Disintegration, 2nd, Tokyo, Japan, April 14-16, 1971, paper 4.)*

The relationships between raw materials and production, consumption and values, and products and by-products are critically reviewed to establish the basic guidelines for an industrial waste disposal system. The desulfurization of heavy oils and the procedsing of the iron ores from mainland and China will occur at the place of production. New manufacturing process are mentioned in the processing of high quality lubricants without using sulfuric acid; the development of inexpensive and effective polymerization preventive agents other than sulfur used in refining styrene monomer; the synthesis of e-caprolactam with less ammonium sulfate byproduct; the development of a new catalyst for polypropylene polymerization with less attacktic (?) production; the separation of oil droplets of less than 100 ppm in waste water by polypropylene or polyurethane; and the removal of the minute mercury content of water by polyethylene glycol. Research on collection, shredding, and disintegration by light or microorganisms are explained and the improvement of the energy efficiency in chemical manufacturing processes is emphasized. In mechanical manufacturing process, such as rolling the development of new lubricants is desired. An example of the new types of combined industry which utilize each other s by-products is the use of sodium sulfite from the sulfur dioxide of a thermal power plant in pulp manufacturing. Iron oxides and SO2 are being recovered by burning the iron sulfate from a titanium white factory and sulfuric acid pitch from a lubricant factory. A global look is taken on the waste disposal problem.

11418 APTIC NO. 29451

Saito, Kiyoshi, Kanju Nishizaki, Isamu Tamura, and Tomiyasu Araki

COMBUSTION OF PLASTICS WASTE IN A FLUIDIZED BED. *(Purasuchikku haikibutsu no baitai ryudo nensho nitsuite). Text in Japanese. Preprint, Japan Society of Chemical Engineering, Tokyo, p. 253-254, 1971. (Presented at the Japan Society of Chemical Engineering Autumn Conference, 4th, Hiroshima, Japan, 1970, Paper D215.)*

An experimental fluidized apparatus of 20 cm inside diameter was used to burn polyethylene and polyvinyl chloride with coal ash as a fluidized medium. Uniform particles were fed in at the rate of 9.55-43 kg/sq m hr. At several weight ratios of bed medium to polyethylene pellets of 2 mm by 4 mm, the particle motion was observed and the differential pressure was monitored as a function of air velocity. The threshold value of air velocity for fluidizing, which was 2.5-3.4 cm/sec at 20 C for coal ash, increased to 6.6, 23, and 45 cm/sec respectively for the polyethylene weight percentage of 15, 30 and 45%. Gas was analyzed for the flue gas and the gas inside the furnace. The plastics and air were supplied at a constant rate; the furnace temperature remained steady at over 500 C. Oxygen consumption was maximum at the air ratio of 0.7-1.1 for a varied plastic s feed rate where the combustion reaction was predominant. At a higher rate of air supply, thermal decomposition became prevalent. The reaction of the decomposed gas with oxygen was incomplete when air stayed in the furnace for less than 0.6 sec for the disposal rate of 43 kg/sq m hr of polyethylene. When air rate rose above a certain value, the combustion was not completed in the fluidized layer and was continued outside the layer. Temperature effects thermal decomposition, heat generated by oxidation, and temperature stability.

11419 APTIC NO. 29452

Iwami, Yoshikazu

COMBUSTION TREATMENT OF WASTE LIQUID AND WASTE GAS. *(Haieki, Hai gasu no shokyaku shori). Text in Japanese. Sangyo Kogai (Ind. Public Nuisance), 7(3-4):176-196, April 1971. 8 refs.*

Recent developments in the combustion treatment method for waste liquid and gas prevent the emission of harmful substances. Generally, the temperature of combustion is 700-100 C, or over, so that organic compounds are completely decomposed, oxidized, and made harmless. Organic compounds containing chlorine must be made harmless by extracting or neutralizing the hydrochloric acid. The combustion method takes up only a small space for the equipment installation, around one tenth of the activated sludge method; it is cheap to construct; some of the substances can be recovered; however, utility cost may increase, but it is possible to use the gas from the incinerator for the condensation of waste liquid, or to install a boiler to utilize the waste heat. Usually, waste liquid is sprayed, by a mechanical method, high pressure current system, or supersonic wave method. The liquids viscosity must be less than 25 cst. The waste gas to be burnt is a mixture of several kinds of inflammable and inactive gases. In planning the equipment, heat must be utilized economically, substances must be recovered as much as possible, minimum safety devices must be installed and optimum operation conditions should be pre-tested. Various flow charts are shown with the patterns of burning waste gas and liquid and the recovery of HCl. Although the combustion method is not applicable to all industrial waste liquids and gases, it is still one of the most presentative methods and is capable of wide-range adoption in the future.

11420 APTIC NO. 29456

Tanaka, Taro and Ichizo Ishimori

DEVICE OF EXHAUST PURIFICATION FOR INTERNAL COMBUSTION ENGINES. *(Nainen kikanyo hiaki joka sochi). Text in Japanese. (Nippondenso Co., Ltd. (Japan)) Japan. Pat. Sho 45-37487. 3p., Nov. 27, 1970. (Appl. Feb. 16, 1967, claims not given).*

The device described jets air near the exhaust valve of the exhaust manifold of an internal combustion engine,, in order to reburn the high temperature exhaust gas and to decrease carbon monoxide and hydrocarbons. At the same time, a part of the exhaust gas from the engine enters the induction manifold to decrease the nitrogen oxides in the exhaust gas. An air pump which supplies air for purification of the exhaust gas is connected to the exhaust gas manifold. By providing a valve in the exhaust passage to change direction, a part of the exhaust is forced into the induction manifold. When the induction load pressure of the engine is large an exhaust gas turbine driven by exhaust gas causes the air pump to rotate. When the induction load pressure of the engine is small, part of the exhaust gas is taken in by the induction manifold through an exhaust gas branch passage. With this system, during idling, low speed, and deceleration, the exhaust gas is reburned with the air for purification, and when the engine is running at high speeds, with a small induction load, the air supply for purification is stopped. By preventing the rise of temperature inside the cylinder, the generation of nitrogen oxides can be suppressed.

MEASUREMENT METHODS

11421 APTIC NO. 27273

Hinkley, E. D. and P. L. Kelley

DETECTION OF AIR POLLUTANTS WITH TUNABLE DIODE LASERS. *Science, 171(3972):635-639, Feb. 19, 1971. 31 refs.*

Preliminary experiments indicate the feasibility of using tunable diode lasers in remote or long-range sensing and point sampling of molecular pollutant gases. The diode lasers are fabricated from vapor-grown single crystals of lead, tin, and tellurium. Remote sensing can be accomplished by means of measurements of the infrared absorption of emission lines characteristic of a particular pollutant at atmospheric pressure. The lasers are 'tailored' chemically to emit anywhere in the wavelength range from 6.5 to 32 micron and tuned quasi-continuously over a range of 40 reciprocal centimeters. Point sampling permits gas pressures to be reduced until the Doppler-broadened infrared absorption structure is revealed, thereby making possible very high specificity. Since one measurement technique is used for all pollutant gases, the operational requirements are simplified. Moreover, the essentially instantaneous response is advantageous for a number of applications, including the rapid detection of gases present in automobile exhaust and in chemical processing plants. By using the lasers as tunable local oscillators in the infrared heterodyne configuration, remote passive detection of gases present in smokestack effluent also appears possible.

11422 APTIC NO. 27278

Schwartz, Arthur

DETERMINATION OF HYDROGEN SULFIDE, SULFUR DIOXIDE, CARBONYL SULFIDE, CARBON DISULFIDE, AND CARBON DIOXIDE IN A GAS MIXTURE. *Anal. Chem., 43(3):389-393, March 1971. 13 refs.*

After studying anomalous results obtained by a standard procedure for the determination of hydrogen sulfide in the presence of sulfur dioxide using aqueous ammoniacal cadmium chloride solutions as the absorbent, hydrogen sulfide was determined in the presence of other sulfur gases which usually interfere. A cupric sulfate solution quantitatively removes hydrogen sulfide as a cupric sulfide precipitate, while another cupric sulfate solution in the presence of chloride ions oxidizes sulfur dioxide to sulfur trioxide. These gases are then determined by applying simultaneous equations to reactions involving the increase of acid and the loss of copper. Carbonyl sulfide and carbon dioxide, which are acidic gases, and carbon disulfide, which is not soluble in water solutions, are not absorbed in the aqueous acidic copper solutions. Simultaneous equations are applied to results obtained by an iodination and by a bromination to determine these sulfur gases, while a standard acid-base analysis determines carbon dioxide. An accuracy of better than 3% and a precision of 0.5% is possible for the determination of hydrogen sulfide and sulfur dioxide. (Author abstract)

11423 APTIC NO. 27285

Lundgren, D. A. and A. R. McFarland

APPLICATION OF A LIGHT-SCATTERING AEROSOL COUNTER AND A FOUR-STAGE IMPACTOR TO INDUSTRIAL HYGIENE AIR SAMPLING. *Am. Ind. Hyg. Assoc. J., 32(1):35-42, Jan. 1971. 14 refs.*

The air in several industrial plants was sampled with instruments that are sensitive to particle number and mass concentration. Areas tested were those in which the predominate particles were flour, silica, metallic smoke, and carbon black/iron oxide. Particle number concentration was determined by impinger, membrane filter (optical microscope), and optical counter, while aerosol mass concentration was determined with a total filter, a two-stage sampler, and a Lundgren Impactor. With respect to comparisons of the optical counter and optical microscope technique, data from experiments with particles that are not substantial light absorbers show that good correspondence is obtained over the size range of 0.3 to 17.6 micron in diameter. However, the polystyrene calibrated optical counter underestimates the size of absorbing particles by a factor of three, probably due to the absence of the internal reflection and refraction portions of scattered light. If the impinger technique data is interpreted as the concentration of all particles larger than one micron, then the impinger shows concentrations that are between 1/4 and 10 times those indicated by the light scattering particle counter and optical microscope methods. Over the range of concentrations of 1-80 mg/cu m, total aerosol mass concentration data agree within a factor of two for all test conditions. Respirable aerosol concentrations determined with the two-stage sampler and the Lundgren Impactor agree within a factor of three. The non-normalized form of the aerosol mass concentration curve provides a means for visual display of the important mass characteristics. (Author abstract modified)

11424 APTIC NO. 27294

Stern, A. C., A. D. Brandt, P. M. Giever, L. Greenburg, E. R. Hendrickson, J. V. Crablè, B. E. Saltzman, G. J. Kupchik, and M. Katz

ABSTRACTS OF TENTATIVE METHODS ADOPTED BY THE INTERSOCIETY COMMITTEE ON MANUAL OF METHODS FOR AMBIENT AIR SAMPLING AND ANALYSIS. *J. Assoc. Offic. Anal. Chemists, 54(1):223-237, Jan. 1971.*

Tentative methods adopted by the Intersociety Committee for the analysis of air samples are abstracted from the following issues of Health Laboratory Science: vol. 6, no. 2(1969) and vol. 7, no. 1 (1970). The methods concern the arsenic content of atmospheric particulate matter; the chloride, fluoride, lead-210, nitrogen dioxide, radon-222, and sulfur dioxide content of the atmosphere; the continuous monitoring of atmospheic oxidant with amperometric instruments; through C5 atmospheric hydrocarbons; polynuclear aromatic hydrocarbon content of atmospheric particulate matter; microanalysis for benzo(a)pyrene in airborne particulates and source effluents; chromatographic analysis for benzo(a)pyrene and benzo(k)fluoranthene in atmospheric particulate matter; spectrophotometric analysis for benzo(a)pyrene in atmospheric particulate matter; preparation of carbon monoxide standard mixtures; carbon monoxide, formaldehyde, antimony and selenium content of the atmosphere; gross alpha radioctivity of the atmosphere; gross beta radioactivity of the atmosphere; and iodine-131 content of the atmosphere.

11425 APTIC NO. 27296

Lilienfeld, Pedro

BETA-ABSORPTION-IMPACTOR AEROSOL MASS MONITOR. *Am. Ind. Hyg. Assoc. J., 31(6):722-729, Nov.-Dec. 1970. 25 refs.*

A sensitive real-time airborne dust mass monitor was developed. Its operation is based on the measurement of beta-radiation absorption by aerosol particles collected onto a small area by means of inertial impaction. The device collects particles of unity density larger than 0.3 micron with nearly 100% efficiency at a flow rate of 20 l/min. With a one millicuric C(14) source, a typical atmospheric mass concentration of 100 micrograms/cu m can be evaluated in less than one min. (Author abstract modified)

11426 APTIC NO. 27298

Lippmann, Morton and Agis Kydonieus

A MULTI-STAGE AEROSOL SAMPLER FOR EXTENDED SAMPLING INTERVALS. *Am. Ind. Hyg. Assoc. J., 31(6):730-737, Nov.-Dec. 1970. 14 refs.*

The design and laboratory evaluation of a new multistage aerosol sampler, incorporating an array of six 10-mm diameter cyclones operated in parallel at varying flow rates is described. Each cyclone samples from a common axial inlet tube at a different flow rate and, therefore, has a different characteristic particle size cutoff. The undersized particles are collected in filters. The particle size distribution of the ambient aerosol is

-determined from the sample masses on the backup filters and a parallel filter which has no pre-collector. Since the cyclone efficiencies do not vary with loading, the sampling intervals can be as long as necessary to obtain the desired sample masses. The instrument should make it easier to perform chemical analysis of specific size fractions of particulate matter. It is also anticipated that the sampler will enable much more size information to be collected in industrial and municipal control operations. (Author abstract modified)

11427 APTIC NO. 27299

Sehmel, G. A.

PARTICLE SAMPLING BIAS INTRODUCED BY ANISOKINETIC SAMPLING AND DEPOSITION WITHIN THE SAMPLING LINE. *Am. Ind. Hyg. Assoc. J., 31(6):758-771, Nov.-Dec. 1970. 23 refs.*

Particle sampling errors from several sources were studied with monodisperse aerosols. The sources of errors investigated were the influence of the inlet probe diameter on isokinetic samples, the turbulent deposition of particles in straight tubes and one elbow configuration, and nonisokinetic flow through the sampling probe. The sampling errors were significant for particles as small as one micron in some cases. A particularly significant observation was that nonuniform concentration in the conduit sampled can cause serious errors. Some studies of the particle concentration profiles in a three-in. tube showed that particles in many cases are concentrated in a narrow annulus near the wall, making representative sampling nearly impossible for these cases. The research emphasizes the need for a thorough knowledge of many particle interactions with the air system to be sampled and with the sampling arrangement chosen. (Author abstract)

11428 APTIC NO. 27300

McFee, D. R., R. E. Lavine, and R. J. Sullivan

CARBON MONOXIDE, A PREVALENT HAZARD INDICATED BY DETECTOR TABS. *Am. Ind. Hyg. Assoc. J., 31(6):749-753, Nov.-Dec. 1970. 5 refs.*

Detector tabs sensitive to low concentrations of carbon monoxide were made available to personnel at the Argonne National Laboratory. The tabs were very small plastic squares containing a small circular depression filled with a granular palladium chloride compound. Carbon monoxide causes the compound to be blacken. A total of 124 persons obtained positive identification of CO with the tabs in either their homes or automobiles. Of this number, 21 found defects in their autos or home heating units that were emitting CO. Because of the demonstrated reliability of the tabs, these results indicate that nonoccupational exposure to CO is a significant problem that warrants continued attention.

11429 APTIC NO. 27307

Miller, David F., William E. Wilson, Jr., and Robert G. Kling

A VERSATILE ELECTROCHEMICAL MONITOR FOR AIR-QUALITY MEASUREMENTS. *Preprint, Air Pollution Control Assoc., Pittsburgh, Pa., 25p., 1970. 6 refs. (Presented at the Air Pollution Control Association Annual Meeting, 63rd, St. Louis, Mo., June 14-18, 1970, Paper 70-2.)*

Information is presented concerning the measurement of pollutant gases prevalent in urban atmospheres, particularly within the range of concentrations encountered in atmospheric and smog-chamber studies. Techniques are described by which the same monitoring instrument may be used to measure total oxidants, nitric oxide, nitrogen dioxide, sulfur dioxide, and other acid gases. A number of instruments make use of iodide reagent to measure total oxidants in the atmosphere and a variety of individual oxidants in simpler systems. Iodine generated from iodide by oxidant is detected by either a colorimetric or coulometric cell. If the iodide reagent is replaced by a mixture of iodata and iodide, the same cell can be used to analyze for acid gases. Both acid and oxidant gases have been measured with the Mast electrochemical meter which incorporates a coulometric technique for titrating iodine. As is the case with oxidants, the response or efficiency to a particular acid gas is a matter of sorption and kinetics. Efficiency, based on Faradaic equivalence, is nearly 100% for gases whose acid strengths in water vary from strong to moderate. Efficiency for very weak acids is less by orders of magnitude. The approximate responses to hydrochloric acid, hydrogen sulfide, carbon dioxide, and formic acid were determined, and a calibration curve for SO2 concentrations ranging from 0.02 to 1.0 ppm is presented. Pretreatment techniques were designed which permitted specific analyses for NO and NOx (using iodide reagent) and for SO2 (using iodide/iodate reagent) during photochemical-smog experiments. Interference observed in the measurement of SO2 was eliminated by passing the sample through a hot fused silica tube. Specific analysis for NO was achieved by passing the sample consecutively over Ascarite, ferrous sulfate granules, and 'dichromate paper'. The same pretreatment without Ascarite was used for NOx analysis. Measurements of these species made by Mast instruments during smog-chamber experiments are presented, along with the measurements made by other techniques. The agreement among measurements is quite good. (Author abstract modified)

11430 APTIC NO. 27320

Nelson, C., J. Granger, R. Koontz, and L. Baurmasb

MEASUREMENTS OF PARTICULATE FILTRATION EFFICIENCIES OF BUILDING. *Harvard Univ., Bostion, Mass. Harvard Air Cleaning Lab. and Atomic Energy Commission, Washington, D. C., Div. of Reactor Development and Technology, Proc. At. Energy Comm. Air Cleaning Conf., 11th, Richland, Wash., 1970, p. 817-823. 3 refs. (Aug. 31-Sept. 3.)*

NTIS: CONT 700816, Vol. 2

The siting of liquid metal fast breeders is influenced by the potential hazard of released fuel and fission product aerosols. At the present time, the site boundary is determined by the gas leak tightness or leak rate of the reactor building, and no credit is given for the reduction of the airborne mass as the particulates pass through the leakage paths in the containment barrier. In the present investigation, it was determined that the airborne mass is considerably reduced as it passes through concrete and other porous materials. Experiments indicate that as much as a 100,000 attenuation of sodium oxide aerosol can be expected as it passes through as little as 1 1/2 in. of concrete. This suggests that a study of the filtration efficiencies of building materials may result in a more realistic assessment of the mass of fuel and fission product aerosols which may enter the environment. (Author conclusions modified)

11431 APTIC NO. 27341

Levaggi, D. A. and M. Feldstein

MICRODETERMINATION OF FLUORIDE IN VEGETATION BY OXYGEN BOMB COMBUSTION AND FLUORIDE ION ELECTRODE ANALYSIS. *Preprint, Air Pollution Control Assoc. Pittsburgh, Pa., 17p., 1970. 9 refs. (Presented at the Air Pollution Control Association,* *Annual Meeting, 63rd, St. Louis, Mo., June 14-18, 1970, Paper 70e66.)*

A procedure for the microdetermination of fluoride in vegetation is proposed which utilizes the oxygen flask combustion technique. Fluoride analysis has been performed traditionally using the Willard-Winter method, which is lengthy and laborious, involving various steps, and large quantities of equipment. Sample size requirements are on the order of a gram or more, making the procedure useless for determining low fluoride concentrations in small samples. Thus, the fluoride selective ion electrode was investigated in combination with oxygen combustion. Gaseous products of combustion are absorbed in 10 ml of 0.05 N sodium hydroxide spiked with 1.00 microgram of fluoride. Analysis of the fluoride is performed directly on the absorption solution after addition of a combination complexing buffer solution, using a specific fluoride ion electrode. The sensitivity of the electrode is such that 0.2 microgram of fluoride can be easily detected. A complete analysis can be performed in one half hour, with a minimum amount of equipment. Added oxidant is required in the combustion step for some vegetation samples to completely free the fluoride from its organic matrix. (Author abstract modified)

11432 APTIC NO. 27355

Shigeta, Yoshihiro

ODOR POLLUTION IN THE CHEMICAL PLANT AND ITS MEASUREMENT METHOD. *(Kagaku kojo ni okeru akushukogai to snon sokuteiho). Text in Japanese. Anzen Kogaku (J. Japan Soc. Safety Eng.), 9(1):20-28, Feb. 1970. 19 refs.*

Sources of odor pollution include petroleum refinery, petrochemical and kraft pulping industries. Direct consequences of odor pollution depend on the pollutant. Hydrogen sulfide and mercaptans are malodorous and chlorine, acrolein, and ammonia are stimulants. The former induce headaches and sick feelings, while the latter attack eyes and throat. Indirect damages are deterioration of property, soiling, and loss of business. The damages extend to an average of 100-200 m downwind from the source, and in some cases extend as far as 4 km or even 7 km. The definition of malodorous gases is difficult, because they cannot be categorized by the industries or processes, or by harms done on the human body. Here the definition bad odor is 'odor that disgusts people' and malodorous substance is gaseous substance, sometimes containing mists and particulates, that induce disgust through olfaction. In Japan odorimetry involves odorless chamber, syringe, or Kinoshita-type (salt solution equilibrium) methods. There is also gas-chromatography such as low-temperature adsorption, vacuum bottle, or solid reactor tube methods. Methods in the U. S. include dilution by air, chemical analysis, and mechanical analysis methods. The continuous (dynamic) method falls into the category of air-dilution and uses an olfactometer or scentometer together with an odor panel. The odor panel must possess the following qualities: discrimination ability, pertinence, stability, and ability to express.

11433 APTIC NO. 27360

Eaton, Harold G.

THE NRL TOTAL HYDROCARBON ANALYZER. *In: Chemical Research in Nuclear Submarine Atmosphere Purification. Naval Research Lab., Washington, D. C., Chemistry Div., NRL-PR-7037, Chapt. 3, p. 17-21, June 2, 1970. 5 refs.*

NTIS, DDC: AD 709896

A gas chromatographic instrument which uses a hydrogen flame ionization detector (FID) as its sensor is described for monitoring trace organic contaminants in nuclear submarines. Compressed air flows first into a catalytic air purifier, then through a lithium hydroxide column. When this purified air is presented to the analyzer it is separated into a bottom portion to serve as combustion air to support the FID, while the remainder serves as the carrier air to push the injected sample through the separation column into the detector. Data are presented on a 1-mv strip chart recorder. Two operating modes are available: one for conventional chromatography of the injected sample, and a second, or back-flush mode, to allow for the wide differences in volatility and concentrations of the numerous individual components present in nuclear submarine atmospheres. A modified electrolytic hydrogen generator is being investigated for use on the vessel to eliminate the problem of supplying bottled hydrogen gas. The Total Hydrocarbon Analyzer is now in commercial production.

11434 APTIC NO. 27366

Samuelson, Gary Scott

ANALYTICAL AND EXPERIMENTAL INVESTIGATION OF AN AMMONIA/AIR OPPOSED REACTING JET. *California Univ., Berkeley, College of Engineering, Thesis (Ph.D.), 192p., Sept. 1970. 61 refs. (NAPCA Grant AP 00385, Rept. TS-70-10.)*

The point-by-point properties of an ammonia/air opposed-reacting- jet (ORJ) flow field are described by solving the governing partial differential elliptic equations. Solutions are compared to three experimental conditions including both reacting and non-reacting flows. The analytical results for the reacting flow are compared to profiles of temperature and composition measured in combustion chamber experiments in which tantalum was used for the opposed jet and mass spectrometry and a Pt/Pt-13% Rh thermocouple were used to determine composition and temperature, respectively. Calculated distributions of stream function, temperature, and fuel mole fraction are presented. It is concluded that the governing equations for a reacting turbulent flow with recirculation can be solved with results consistent with experimental measurements, although more refined models of kinetics and turbulence and more extensive correlation to controlled experiment are necessary. Analytical results indicate a zone of near-homogeneous mixture and uniform temperature located downstream of the stagnation region of the ORJ. Boundary conditions must be controlled and monitored experimentally to provide accurate inputs to the numerical model. The ORJ is attractive as a research tool for studying reacting mixing flows, for example, in the investigation of air pollution emissions in continuous combustion systems. (Author conclusions modified)

11435 APTIC NO. 27370

Singh, Trilochan

CARBON MONOXIDE REACTIONS IN THE AFTER-FLAME ZONES OF ETHYLENE/ OXYGEN AND ETHANE/OXYGEN FLAMES. *California Univ., Berkeley, Coll. of Engineering, Grant PHS AP 00385, Rept. TS-70-2, 199p., June 1970. 121 refs.*

The kinetics of carbon monoxide disappearance in the after-flame zone of ethylene/oxygen and ethane/oxygen flames at equivalence ratios of 0.67, 0.80, and 1.0, pressures of .083 and .054 atm and a temperature range of 1500 to 1700 K, supported on a water-cooled rectangular flat flame burner were investigated. Selection of this system was made because it offers a close similarity to those occurring in several practical combustors, such as home furnaces, gas fired water heaters, power plants, and other processes which use premixed charges of hydrocarbon fuels. Composition profiles of such stable species as carbon monoxide, carbon dioxide, oxygen, water, nitrogen, and argon were determined by subjecting the gas samples to mass spectrometric analysis. Profiles of a hydroxyl radical, an unstable species, and temperature were obtained by using ultraviolet absorption spectroscopy. Theoretical multicomponent diffusion coefficients were used for calculating the net reaction rates from the composition and temperature profiles. The overall reaction rates for CO and CO2 were also calculated from a postulated reaction mechanism for the CO/O2/hydrogen system and compared with those deduced from the observed composition and temperature profiles. Theoretical flame structures were calculated by numerical integration of the coupled kinet rate equations and the diffusion equations. Measured temperature profiles were employed obviating the necessity for including the energy conservation relations. Although a consistent disagreement was obtained between the observed and calculated profiles of CO, CO2, OH, H2O, and O2, a systematic variation in the value of rate coefficients for various reactions and initial estimates for the radical species (H and O) concentrations leads to a good qualitative agreement between the theoretical and experimentally observed mole fraction profiles. (Author abstract modified)

11436 APTIC NO. 27389

Delaughter, Buford

MERCURY DETERMINATION IN INDUSTRIAL PLANT ATMOSPHERES BY ATOMIC ABSORPTION SPECTROPHOTOMETRY. *Atomic Absorption Newsletter, 9(2):49-50, March-April 1970. 2 refs.*

A simple and accurate procedure is described for the determination by atomic absorption spectrophotometry of any form of mercury in industrial atmospheres. A sample of air containing mercury vapor is collected by scrubbing through a 1 N hydrochloric acid solution, the pH of which is adjusted to 2.5-4.0 with mercury-free caustic and chelated with ammonium pyrrolidine dithiocarbamate (APDC). The resulting complex is extracted into an organic medium, and the concentration of mercury determined from absorbance at 2537 A. An equation is given for finding the concentration of mercury in air from the concentration in the extracted sample.

11437 APTIC NO. 27430

Benedict, Harris M.

FIELD SAMPLING FOR THE PRESENCE OF FLUORIDES IN FORAGE CROPS. *Preprint, Air Pollution Control Assoc., Toronto, Ontario Section, Air Pollution Control Assoc., Pittsburgh, Pa., Tk-7 Agricultural Committee, and Ontario Dept. of Energy and Resources Management, Toronto, Air Management Branch, 19p., 1970. 21 refs. (Presented at the Impact of Air Pollution on Vegetation Conference, Toronto, Ontario, April 7-9, 1970.)*

A field sampling program that has been successfully used for almost 20 years to obtain information on fluorides in forage crops is described. The program uses a coordinate system for locating and identifying the sampling sites. This system provides a uniform geographic reference for all phases of the field surveillance programs; facilitates the transfer of investigational data from notebook to maps; and enables quick reference between laboratory data and geographic origin of any one sample. Methods employed to assure a representative sample and an accurate analysis are noted together with methods of tabulating analytical results into readily useable form and of interpreting the assembled data. Data are presented on monthly variation of fluoride levels in plants, the reduction of fluoride levels by rainfall, and on the comparativ fluoride content of different grass and alfalfa species.

11438 APTIC NO. 27475

Baba, Yoshio

ANALYSIS OF ODOR COMPONENT: GAS CHROMATOGRAPHIC DETERMINATION OF SULFUR COMPOUNDS BY THE FLAME PHOTOMETRIC DETECTOR. *(Shuki seibun no bunseki: senko kodogata kenshutsuki tsuki gasukuromatografu ni yoru biryo iou kagbutsu butsu no bunseki). Text in Japanese. Kogai (Pollution Control), 5(4):204-215, July 1970. 13 refs.*

A concentration process is described for preparing odorous sulfur compounds for gas chromatographic analysis by a flame photometric detector (FPD). Concentration is based on extraction by air, absorption by powdered celite, and subsequent cooling with dry ice-ethanol. A small amount of the absorbed sample is then placed in front of the separation column and the odor component desorbed by nitrogen carrier gas and detected by the FPD. This method was successfully used to determine hydrogen sulfide, mercaptans, and sulfides in such practically odorless substances as wood, hop, beer, and refinery waste water. Selective elimination of mercaptans in a mixture of sulfur compounds was studied to obtain a simple group analysis of sulfur compounds on the gas chromatogram. Solid absorbers were prepared by sintering aqueous solutions of metals salts on powdered celite. Mercaptans in the sulfur compounds could be removed selectively with cadmium chloride and sodium carbonate, but silver nitrate and mercuric sulfate exhibited no selectivity. The relative retention values of 19 sulfur compounds were also determined. (Author abstract modified)

11439 APTIC NO. 27480

Golden, J. and T. R. Mongan

SULFUR DIOXIDE EMISSIONS FROM POWER PLANTS: THEIR EFFECT ON AIR QUALITY. *Science, 171(3969):381-383, Jan. 29, 1971. 4 refs.*

A modeling study of atmospheric diffusion indicates that emission from power plants contributed only a modest percentage of the yearly average concentration of sulfur dioxide at ground level in the most polluted areas of Cook County, Illinois, during 1968. Developed by the National Air Pollution Control Administration, the Air Quality Display Model is based on a Gaussian diffusion equation which describes the diffusion of a plume as it is transported from a continuously emitting source. The model computes the expected annual average concentrations at ground level at specified receptor sites, which result from both point and area sources, as well as the percent of the concentration contributed by each contaminant at the receptor points ascribable to each source. In this case, a grid of receptor points was overlaid on a map of Cook County. With an inventory of emissions for 1968 compiled by NAPCA, the location and strengths of point and area sources of SO2 were entered. Meteorlogical data were obtained from the National Weather Records Center, and the measured annual average concentrations of SO2 for 1968 were taken from data compiled by the city of Chicago. Effective abatement considerations are mentioned in view of the findings.

11440 APTIC NO. 27486

Konno, Shinya, Noriko Yamamoto, and Saburo Yanagisawa

APPLICATION OF A NEW FOAMING AGENT TO THE RECOVERY OF SULFUR TRIOXIDE. *(Homatsu niyoru musui ryusan no hoshuho). Text in Japanese. Bunseki Kagaku (Japan Analyst) (Tokyo), 20(1):102-104, Jan. 1971. 5 refs.*

A new sampling technique was developed for collecting sulfuric acid aerosol formed in the atmosphere by the presence of water vapor and sulfur trioxide. In the conventional processes that employ a bubbler, the aerosol is not always absorbed in water. The new process uses an aqueous solution of nonionic surfactant (0.05 weight percent polyoxyethylene alkylphenolether) with isopropanol (28.8 volume percent) added as an antifoaming agent for adjusting the height of the foam on the absorbent. The foam height was maintained at 12 cm in a 250-ml bubbler for a gas flow rate of 1 l/min. a standard solution of 100 to 700 ppm sulfur trioxide (2-) was prepared and a calibration curve of sulfate ion obtained. For titration, a capillary was attached to the tip of microburette to improve the accuracy. A standard deviation of 50 micrograms was observed in terms of SO3(2-). In addition, the background equivalent to 40 micrograms was present, which lowered the sensitivity to 100 micrograms. The sulfate ion was collected by the first and second absorbing solution, and lastly by a cold trap. The proportion of the ion collected by the first solution to the total amount collected by the three stages was designated the collecting efficiency, which was higher than 99.5%. The surfactant employed was found not to interfere with the determination of sulfur trioxide by Arsenazo III method.

11441 APTIC NO. 27508

Griggs, Michael, Claus B. Ludwig, Roy E. Bartle, and Carlos N. Abeyta

PASSIVE INFRARED REMOTE SENSING OF AIR POLLUTION. *Preprint, Air Pollution Control Assoc., Pittsburgh, Pa., 31p., 1970. 8 refs. (Presented at the Air Pollution Control Association, Annual Meeting, 63rd, St. Louis, Mo., June 14-18, 1970, Paper 70-125.)*

A high resolution infrared spectrometer is described to measure the emission spectra of polluted atmospheres. Radiation is collected by a telescope, dispersed by a grating monochromator, and measured by a helium cooled germanium:mercury detector. The output is displayed as a function of wavelength on a strip chart recorder. Improvements to achieve a maximum signal-to- noise ratio are mentioned. The electronic processing system consists of a variable gain amplifier. a phase locked chopper, and a phase lock amplifier. Two examples of spectra obtained with an early version of the instrument include a trace from the roof of a building on a day of considerable smog and a spectrum recorded on a very clear day, just after a rainstorm. Results of direct observations of atmospheric emission in the 10-12.5 micron region are presented and discussed. The instrument may also be used to determine actual concentrations more accurately by a 'skyscraper experiment,' in which the instrument is pointed at a building or hillside a known distance away. Results of this type of experiment in the 8 micron region are discussed in relation to traffic density.

11442 APTIC NO. 27516

Huang, Chao-Ming, M. Kerker, E. Matijevic, and D. D. Cooke

AEROSOL STUDIES BY LIGHT SCATTERING. VII. PREPARATION AND PARTICLE-SIZE DISTRIBUTION OF LINOLENIC ACID AEROSOLS. *J. Colloid Interface Sci., 33(2):244-254, June 1970. 17 refs.*

In a study of the kinetics of coagulation of aerosols, linolenic acid was chosen because it can be solidified for electron microscop observation. This permits a direct comparison of the size distribution as determined from the electron microscope with that from light scattering. Also, it is possible from the electron micrographs to determine whether or not the coagula actually coalesce to liquid droplets. Furthermore, as the coagulation proceeds and the initial aerosol of narrow size distribution become more polydisperse, light scattering becomes decreasingly effective for determination of the size distribution. Determination of the polarization ratio only requires measurement of the galvanometer deflections corresponding to the horizontally and vertically polarized components of the scattered light. Linolenic acid aerosols of narrow size distribution are generated by condensation of vapor upon sodium chloride and silver chloride nuclei in a gas stream. These aerosol particles can be solidified with osmium tetraoxide for electron microscopic observation. The particle-size distribution is determined by analysis of the angular distribution of the polarization ratio of the scattered light. In addition, the particle concentration is obtained from the absolute value of the Rayleigh ratio. Performance of the aerosol generator has been studied with respect to operating conditions such as flow rate, boiler temperature, nuclei furnace temperature, and nuclei concentration. (Author abstract modified)

11443 APTIC NO. 27517

Endo, Ryosaku, Tatsunori Oyake, and Tetsutaro Kohgo

STUDIES ON THE STANDARDIZATION FOR THE MEASUREMENT OF AIR POLLUTANTS. PART I. ON THE DYNANIC CALIBRATION OF SO2 ANALYZER AN ITS INTERFERING FACTORS WITH THE MEASUREMENT OF SO2. *(Taiko osenshitsu sokuteiho no hyojunka ni kansuru kisoteki kenkyu. Dai 1 ho. Aryusan gasu jidosokutei sochi no doteki kentei narabini sokutei bogai inshi ni kansuru kenkyu). Text in Japanese. Hokkaido Ritsu Eisei Kenkyushoho, no. 20:191-200, June 1970. 6 refs.*

The electroconductivity analyzer for analysis of sulfur dioxide was calibrated dynamically by standard low concentration of sulfur dioxide to be generated from Teflon permeation tubes. The wWest Gaeke method too was calibrated by the same method. The permeation tubes were placed in the calibration apparatus, in which the temperature was controlled at 25 plus or minus 0.1 C. Periodically the permeation tubes were rapidly weighed with a semimicro balance. The weight loss of the tubes per minute was almost constant. The average values of the SO2 concentrations measured by the electroconductivity analyzer were reduced by 1.9-3.4% from the average values for the tube computed from the gravimetric data. Th average values of the SO2 concentrations measured by the West-Gaeke method were reduced by 1.3-4.0% from the gravimetric calibration for the tube. When the humidity was less than 20%, the adsorptions of the new glassfiber filters for SO2 (Gelman A type) were larger than any other fiber papers. The new glassfiber filters adsorbed 22.4% in 0.2 ppm of the SO2 concentrations, but by using continuously, the adsorption of glassfiber filters was reduced gradually. The filter papers (Toyouroshi No. 1) adsorbed about 10% and Whatman No. 4 about 2% in 0.2 ppm of the SO2 concentration. The adsorption of new filter papers was almost the same as older filter papers. Their adsorption rates were lower in the high concentration than in the low concentration in the case of three kinds of filters. When the humidity was 60%, the adsorptions of the new glassfiber filters, (Gelman A type) for SO2 were markedly large. They adsorbed 60.4% in 0.1 ppm of the SO2 concentration, 44.6% in 0.2 ppm and 27.2% in 0.5 ppm. The new Toyouroshi No. 1 and Whatman No. 4 adsorbed about 10%. Their adsorption rates were higher in high humidity than in low humidity. The adsorption of Teflon pipes was lower than any other kind of pipes. In low humidity, glass pipes adsorbed almost the same degree as Teflon pipes, but in high humidity, glass adsorbed 15-24% of the SO2 concentration. Teflon was no influenced by humidity. The vinyl chloride pipes did not adsorb, but increased the measurement values The interfering substances with the measurement by the electroconductivity analyzer were generated from the new vinyl chloride pipes. The measurement values were higher than the real values, according to a loss in quantity of absorbing solution by babbling. In the case of low humidity, low adsorbing solution, and abundant air flow, this error was increased.

11444 APTIC NO. 27526

Weinstein, Leonard H. and Delbert C. McCune

EFFECTS OF FLUORIDES ON VEGETATION. *Preprint, Air Pollution Control Assoc., Toronto, Ontario Section, Air Pollution Control Assoc., Pittsburgh, Pa., TR-7 Agricultural Committee, and Ontario Dept. of Energy and Resources Management, Toronto, Air Management Branch, 31p., 1970. 99 refs. (Presented at the Impact of Air Pollution on Vegetation Conference, Toronto, Ontario, April 7-9, 1970.)*

Fluorides are emitted in both gaseous and particulate forms in the manufacture of phosphate fertilizers, brick, ceramics, glass, enamel frit, beryllium, aluminum, steel, nonferrous metals, and from other sources. Hydrogen fluoride and silicon tetrafluoride ar the predominant gaseous forms and represent the most important form of fluoride injurious to vegetation. Symptoms induced by atmospheric fluoride on broad and narrow-leafed plants are described, and effects on growth, yield, and reproduction are discussed. Other important factors influencing symptom expression and growth effects, such as stage of development of the plant, specific and varietal differences, environmental effects, concentration of fluorides in the atmosphere, and duration and frequency of exposure, are also reviewed. Enforcement of an air quality standard for fluoride will require sampling not only of air but also of native or economically important vegetation. Methods of concentration, separation of gaseous and particulate forms and determination are noted. (Author abstract modified)

11445 APTIC NO. 27536

Layton, Ronald F., D. Spath, and James O. Pierce

MONITORING OF OZONE IN AIR BY THE PEROXY/ISOCYNATE METHOD. *Am. Ind. Hyg. Assoc. J., 31(6):738-741, Nov.-Dec. 1970. 22 refs.*

Methods previously used for the analysis of ozone in low concentrations are summarized together with their disadvantages. A new method involving the oxidation of aromatic isocyanates by labile-containing peroxy compounds is investigated with respect to its ability to analyze labile-hydrogen containing oxidants in the presence of ozone at relatively high concentrations. Further work is indicated, but preliminary results suggest that the method will have some utility in differentiating between ozone, peroxyacetyl nitrate, nitrogen dioxide, and labile-hydrogen containing compounds in the atmosphere.

11446 APTIC NO. 27542

Kurabayashi, Toshio, Tetsuya Nakazawa, and Takao Karasawa

ON MEASUREMENT OF SMOKE DENSITY BY THE PAPER FILTERING SMOKE METER AND THE DETERMINATION OF CARBON QUANTITY. *(Roshishiki haiki nodokei niyoru haiki nodo no sokuteiho to kabon no teiryo nitsuite) Text in Japanese. Jidosha Gijutsu (Automobile Eng.), 24(4):341-346 April 1970. 6 refs.*

The process of smoke-particle deposition on filter paper was theoretically analyzed. The theory of probability was applied to calculate the white area when a certain amount of carbon particles had been deposited on the filter. The relation between the meter reading and the white area percentage was obtained and was employed to derive a formula giving the amount of carbon from the meter reading. To check the validity of the theory, an experiment was conducted using a steady-smoke generator and photoelectric color meter. Smoke was produced by the incomplete burning of propane. A diagram of the sampling apparatus is shown, as is a sample holder design. Six kinds of filters were employed to catch the carbon particles. The thicker the filter, the more stable the light reflection. The derived formula was valid. The carbon content of the combustion gas was quantitatively determined by the meter reading if the carbon concentration on the filter was within a certain range. Beyond this, the error increased rapidly. The effect of filter characteristics on the meter reading was inconsiderable. The Bosch smoke meter was chosen as a typical, commercially available meter of the filter paper type. It was checked by the photoelectric color meter; correlation was satisfactory.

11447 APTIC NO. 27547

Hu, John Nan-Hai

AN IMPROVED IMPACTOR FOR AEROSOL STUDIES--MODIFIED ANDERSEN SAMPLER. *Environ. Sci. Technol., 5(3):251-253, March 1971. 13 refs.*

An Andersen sampler was modified to extend its lower range from 0.56 to 0.17 micron by operating the Andersen sampler at 3 cu ft /min instead of the designed value of 1 cu ft /gqn. Tye co=ventio=al method of coating the collection surface with grease or other materials did not effectivtely eliminate parttitc/p ;teft/p,zz½tttz½tjt tEzftgjz1jztmttz mjtemation was obtained by use se of glass-fiber filters as collection plates. The modified Andersen sampler was calibrated with a Royco Particle Counter (Model 200A) and monodispersed polystyrene particles. The wall loss was very low in the range of particle sizes studied. (Author abstract)

11448 APTIC NO. 27552

Conti, A. B. La and H. J. R. Maget

ELECTROCHEMICAL DETECTION OF H2, CO, AND HYDROCARBONS IN INERT OR OXYGEN ATMOSPHERES. *Electrochem. Technol., 118(3):506-510, March 1971. 5 refs.*

A unique electrochemical sensor is described for quantitatively detecting hydrogen in gas mixtures containing electrochemically inert species. Limiting diffusion current measurements in the range of + 0.25 to 0.65 V vs. a platinum electrode in the same acid solution are proportional to the hydrogen content in the bulk phase. When active species, such as oxygen, are present in binary or ternary gas mixtures, the hydrogen content of the gas phase is determined by maintaining a working electrode potential of + 1.06 V (oxygen or air rest potential on Pt black in acid) at which hydrogen is immediately ionized even in the presence of oxygen on the electrode surface. The feasibility of detecting carbon monoxid and hydrocarbons in oxygen-containing atmospheres using the electrical biasing technique is demonstrated. Limitations and practical applications of the sensing devices are discussed. (Author abstract)

11449 APTIC NO. 27554

Nakagawa, Terushin

QUALITATIVE ANALYSIS USING GAS CHROMATOGRAPHY AND INFRARED SPECTROCHEMICAL ANALYSIS TOGETHER. *(Gasukuromatograhui to sekigaisen bunko-kodokei o heiyosuru teisei-bunseki). Text in Japanese. Bunseki Kiki (Analysis Instr.), 9(3):151-159, March 1971 33 refs.*

Infrared spectrochemical analysis is employed for the quantitative analysis of substances identified by gas chromatography. Samples for IR analysis can be introduced directly into the IR cell, collected in a flow-type cell trap, or transferred to the IR cell after collection in other types of traps. Recent reports on the efficiencies of these methods are reviewed. A collection efficienc of 80% was realized by the use of millipore filters of cellulose ester (average hole diameter: 0.45 micron), which collect not only sample gas but also carrier gas. A syringe coiled by dry ice yielded an adequate spectrum from only 10 micrograms of a sample. With double trapping, collection efficiency was 95-100%. The table method provided a barbital spectrum from only one microgram of sample. Re-collection of 1-10 micrograms of a sample on potassium bromide gave almost 100% collection efficiency. Loss of sample content is avoided by direct collection of gas in the IR cell. Maximum collection efficiency for 1.0-0.06 microliters of acetone at a carrier gas flow of 25-150 ml/min was 90%. Collection by heating of a sample in the gas phase was improved by the developmen of a multiple reflection cell: a 240-cm long optical path was realized. The problem with this method is the relation between the peak of the sample gas flow volume and that of the IR cell: swift detector and indicator response are required together with high-speed scanning. Satisfactory analysis was achieved by keeping the cell trap in the route of gas flow and using a high-speed multiple scanning, interference infrared spectroscope with a continuous indicator. This method also enables identification of substances with a common peak.

11450 APTIC NO. 27556

Tada, Osamu

ON THE MEASUREMENT OF LEAD. *(Namari no sokutei ni tsuite). Text i Japanese. Rodo Kagaku (J. Sci. Labour, Tokyo), 25(10):36-39, Oct. 1970. 7 refs.*

The measurement of lead in air and in blood or urea is reviewed. An outline of widely-used analytical methods is given along with comments on general problems in measurement. The analytical methods cited include the dithizone method, polarography, atomic absorptiometry, and emission spectral analysis. Fundamentals and characteristics, detection limits, and advice on the preparation of samples are summarized for each method. In addition, examples of analytical results are presented. Lead exists in air in the form of particulates, fumes, or tetralkyl vapors. Impingers, electric precipitators, or filters are used for the collection of particulates; glass fiber or millipore filters for fumes; and activated carbon or absorption by iodo (crystal) for tetralkyl lead vapors. Analysis of lead in blood or urea requires pretreatment of samples by incineration to remove organic ingredients. Incineration, which is classified as wet or dry, can be adapted to any analytical method. More simple methods can be used in the case of atomic absorptiometry, however. Among them are the albumin removal method, blood corpuscle separation, or the extraction of lead from urea.

11451 APTIC NO. 27560

Wolf, Philip C.

CARBON MONOXIDE: MEASUREMENT AND MONITORING IN URBAN AIR. *Environ. Sci. Technol., 5(3):212-219, March 1971. 9 refs.*

Extensive, continuous measurement of carbon monoxide levels in ambient air is essential to the establishment and enforcement of air quality and automotive emission standards. The most practical device for accurately measuring CO concentrations is the infrared nondispersive analyzer, which measures the specific radiation absorption on polyatomic, nonelementary gases in the infrared spectral range. The analyzer is typically used in conjunction with a sampling probe, refrigeration unit, filter, pump, flow meter, and automatic calibration unit. Telemetry equipment can be included for direct data transmission from the analyzer to a central collection point. Currently, infrared analyzers are employed in the monitoring of restricted areas, such as mines and vehicular tunnels, and of broad geographic areas. In the latter connection, they are used by both the Continuous Air Monitoring Project of the Air Pollution Control Office (formerly NAPCA) and the New Jersey Air Monitoring Network. In addition, infrared analyzers are also set up in mobile field laboratories for the study of factors influencing CO concentrations and distribution.

11452 APTIC NO. 27571

Nikitinskaia, N. I., A. J. Perelman, and K. S. Shifrin

THE ATMOSPHERIC AEROSOL STRUCTURE, AS DEFINED BY THE METHOD OF SPECTRAL TRANSPARENCY. *(Opredeleniye struktury atmosfernogo aerozolya metodom spektral'noy prozrachnosti). Text in Russian. Doklady Akad. Nauk SSSR, 190(2):331-333, 1970. 10 refs.*

The method of transparency is demonstrated to yield valuable information regarding the particle size distribution of atmospheric aerosol particles using simple equipment (thermoelectric actinometer, galvanometer, and an appropriate interference light filter). Data from a 50-day study conducted in the summer and fall of 1951 in the vicinity of Leningrad are reported. This method permits distinguishing Aitken nuclei (r about 0.1 micron), soluble chloride and sulfate nuclei (r about 0.4 micron), and soluble calcium particles (r about 0.7-1 micron).

11453 APTIC NO. 27619

Byers, R. L., J. W. Davis, W. L. Matson, and H. A. McKinstry

A NEW TECHNIQUE FOR CHARACTERIZING ATMOSPHERIC AEROSOLS FOR SIZE AND SHAPE. *Preprint, Air Pollution Control Assoc., Pittsburgh, Pa. 24p., 1970. 11 refs. (Presented at the Air Pollution Control Association, Annual Meeting, 63rd, St. Louis, Mo., June 14-18, 1970, Paper 70-65.)*

Computer Evaluation of Scanning Electron Microscope Images (CESEMI) techniques are applied to characterization of solid suspended atmospheric particulates. An electrostatic precipitator was used to sample various atmospheric dusts in order to provide a substrate that can be used directly in the SEM. SEM images processed by digital computer produce reliable size measurement on nonvolatile particulates as well as a contour analysis for each individual particle. An ellipse of best fit, calculated on each particle, permits determination of an aspect ratio, which is a measure of the particle shape. Results of manual versus SEM size distributions compare favorably. A shape analysis suggests that the cumulative distribution of aspect ratios is log-normally distributed and is not a function of the time of day the original dust sample was taken. It appears that the submicron particles are more nonuniform in shape than particles one micron and larger with the latter, showing a greater variation from a 'spherical' shape than the former. Further development is in progress to permit improved resolution for routinely processing particles smaller than about 0.1 micron, to calculate particle volumes from SEM images, and to define chemical composition, in part by x-ray emissions. (Author abstract modified)

11454 APTIC NO. 27630

Rinehart, Gayle S.

A NEW METHOD FOR DETECTING MICRON-SIZED SULFATE AND WATER-SOLUBLE PARTICLES AND ITS USAGE. *Army Electronics Command, Fort Monmouth, N. J., TR-ECOM-5302, OSD-1366, Task IT061102B53A-20, 16p., May 1970. 10 refs.*

NTIS, DDC: AD 709609

A new reagent substrate is described for used in the chemical analysis and size estimation of airborne sulfate particles, in connection with the modification and control of warm fog and clouds for civilian and military purposes. The substrate, which is used to detect soluble micron-sized atmospheric sulfate and certain other water-soluble particles with a light microscope, is easily prepared from an aqueous solution of polyvinyl alcohol (PVA), barium chloride, glycerol, and Triton X-100, which is spread on a glass slide and dried. Particles are collected on the slide and then observed under a dark field or phase contrast optical miscroscope. Under humid conditions barium chloride reacts with sulfate particles to form PVA-insoluble barium sulfate. The precipitates in a Liesegang ring while nonsulfate water-soluble components dissolve into the PVA-medium. Photomicrography before and after moisture treatment reveals the sulfate and soluble constituents of the particulate sample. The method can be employed to detect sulfate particles as small as 0.3 micron. The number of soluble particles and percent sulfate composition per particle in aerosol samples can be estimated. Comparison of sampled atmospheric aerosol sulfate weight to sulfate weights of similarly unpolluted locations supports the validity of the method. (Author abstract modified)

11455 APTIC NO. 27659

Chapkevichene, Ye. S.

THE PROBLEM OF COLORIMETRIC DETERMINATION OF SULFURIC ACID IN THE ATMOSPHERE. *(K voprosu kolorimetrichskogo opredeleniya sernoy kisloty v atmosfernom vozdukhe). Text in Russian. Gigiena i Sanit., 35(9):59-61, 1970. 5 refs.*

Sulfuric acid is detected photocolorimetrically as benzidisulfate precipitated by benzidine in an ester. This method, used with prepared samples containing 0.0016-0.056 mg H_2SO_4, was more rapid and accurate (to within 10.3%) than the nephelometric method using an FEK-56 nephelometer.

11456 APTIC NO. 27660

Savina, A. A. and E. M. Bomshtein

A METHOD OF CLARIFYING AFA FILTERS FOR DETERMINING THE CONCENTRATIO OF DISPERSED DUST. *(Metod prosvetleniya fil'trov AFA dlya opredeleniya kontsentratsii i dispersnogo sostava pyli). Text in Russian. Gigiena i Sanit., no. 11:60-61, 1970. 2 refs.*

A standardized method for clarifying AFA filters using acetone vapor so as to obtain uniform specimens suitable for microscopic counting and classification of dust grains is described. The dust grains are taken up by vapor-moistened filter paper mounted on a glass carrier. These plates are then 1/3 immersed in boiling water for 1 minute, numbered, and stored for subsequent examination.

11457 APTIC NO. 27681

Tanaka, Katsuhiko, Katsuhisa Fukaya, Kikyoku Kasutani, Shozo Fukui, and Saburo Kanno

ATOMIC ABSORPTIONMETRY OF LEAD IN GASOLINE. *(Gasorinchu no namari no bunsekiho to ganyuryo no suii). Text in Japanese. Preprint, Kyoto Univ. (Japan), Disaster Prevention Research Inst., 2p., 1971. (Presented at the Kyoto University Research Institute for Disaster Prevention Conference, 11th, Kyoto, Japan, Jan. 22-23, 1971.)*

A new, expedient method of checking the variation in the amount of tetraalkyl lead added to gasoline uses atomic absorption spectrophotometry. The key to the method lies in comparing the absorption coefficient of lead obtained by the atomic absorption analysis of two types of standard solutions containing lead. One type of lead is derived from tetramethyl or tetraethyl lead as a standard substance, and the other is obtained from lead nitrate. Lead in tetraethyl or tetramethyl lead is extracted by methylisobutyl ketone (MIBK); that in lead nitrate is extracted in MIBK after the lead has been changed into metal chelate by means of sodium diethyldithiocarbamate (DDTC). Since the absorption coefficient for the two types of lead are in agreement, lead nitrate can be used as the standard substance instead of dealing with the dangerous tetraalkyl lead.

11458 APTIC NO. 27685

Ishiguro, Tatsukichi

MEASUREMENT OF RANK ODOR. *(Akushu kogai no sokutei to sono boshiho). Text in Japanese. PPM (Japan), 2(2):35-47, Feb. 1971.*

A quantitative indicator of rank odor is very much needed. The low concentration and multicomponent mixture of rank odors is the object of odor pollution control. Nitrogen or sulfur compounds and several kinds of organic compounds are the main substances causing bad smells. A dedorization effect is generally expected for a removal efficiency of more than 99.9-99.99%. The wide range of distribution of threshold values of rank odors also impedes rank odor control. Gas chromatography is widely used for determining rank odor. Condensation of sampled gas is the feature of this method, which has good reproducibility and separate power. Direct condensation is desired for this method, as sampled gas contains a comparatively large amount of water or carbonic acid gas. Adsorption on the surface of a packed agent makes possible the collection of a comparatively complete amount of odor particles or molecules. In comparison to all other gas chromatographic methods, the glass beads method is best in respect to preparation, handling, preservation, easy sampling, and commonness of samples. This method has been applied to hydrogen sulfide, sulfides, mercaptans, ammonia, amines, aldehydes, and several kinds of fatty acid. Mass spectrography is used as the method for qualitative analysis, especially for recognition of substances detected by gas chromatography. A sense test is adopted for quantitative determinations; to strength of odor does not necessarily agree with the concentration of odor substances detected. The air dilution method is the best of all sense tests, in spite of the adsorption of odor substances, and the mechanism of dilution. An odorless chamber is widely utilized for the method which also is applied to determine threshold value. The injector method is easy to perform and is expected to be used widely. The equilibrium method with sodium chloride is based on Henry's law and is also easy to perform.

11459 APTIC NO. 27768

Wronski, Mieczyslav

THIOMERCURIMETRIC DETERMINATION OF HYDROGEN SULFIDE, CARBON DIOXIDE AND OF THIOLS IN ATMOSPHERIC AIR. *(Thiomercurimetrische Bestimmung von Schwefelwasserstoff, Schwefelkohlenstoff und Thiolen in atmosphaerischer Luft). Text in German. Z. Anal. Chem., 253(1): 24-27, 1971. 5 refs.*

The application of o-hydroxymercuribenzoic acid (HMB), of dithiofluorescein and of tetraacetoxymercurifluorescein (TMF) in the determination of very small quantities of hydrogen sulfide, of carbon disulfide, of carbon sulfoxide and of thiols is described. The method is 200 times as sensitive as the methylene blue method. The determination of CS_2 and of COS is based on their reaction with secondary amines and subsequent titration with TMF in alcohol. Also, cyanides can be determined fluorometrically with TMF. The method is based on the circumstance that free TMF; complexes with cyanides in aqueous and alcoholic solution; and complexes with thiols, dithio and thiocarbamidates in alcoholic solution fluoresce strongly while complexes with sulfides and 8-hydroxy- quinoline fluoresce only weakly or not at all. Thus in the titration of sulfides with TMF, fluorescence increases after all sulfide ions have been used up. The method will register H_2S in the atmosphere down to a concentration of 0.003 microg. Oxidation by air is prevented by stabilization with zinc salts or with tetraethyl chloride.

11460 APTIC NO. 27769

Waclawik, Jerzy and Stefan Waszak

METHOD FOR DETERMINING CONTINUOUSLY SMALL CONCENTRATIONS OF GASEOUS HALOGENATED COMPOUNDS AND OF HYDROGEN HALIDES IN AIR AND IN OTHER GASES. *(Assignee not given.) U. S. Pat. 3,546,079. 3p., Dec. 8, 1970. 6 refs. (Appl. Feb. 8, 1967, 6 claims).*

A method is described for continuously determining gaseous halogenated organic compounds such as trichloroethylene, tetrachloroethylene, chloroform, methyl bromide, or phosgene, and hydrogen halides such as hydrogen chloride, hydrogen bromide, or hydrogen fluoride. Known methods are mostly qualitative, laborious and time-consuming, but the present method overcomes these disadvantages by converting the halogen combined in the organic compound into a free halogen. This is accomplished by passing the compound continuously through a furnace filled with a palladium catalyst at about 800 C. Then the combustion products from the furnace are passed through a tube filled with a bromide-bromate mixture or an iodide-iodate mixture or through a washer filled with an aqueous solution of the respective salts. Free halogen can be determined by known methods, preferably in the galvanic cell of a gas analyzer.

11461 APTIC NO. 27781

Balmer, Tom

FLEXING WELDED BELLOWS PUMPS CLEAN AIR. *Design News, 26(3):35, Feb. 8, 1971.*

A stainless-steel welded bellows, used as a pumping mechanism, provides a contamination-free air supply. Recently introduced vacuum pump/compressors, of Type 300 Series stainless steel, are leak-free and have no wearing or rubbing parts, or organic seals. Typical applications of the bellows include pumping diesel and turbine exhaust to a flame ionization detector, gas sampling for sulfur dioxide, aspirating systems for medical instrumentation, computer peripheral equipment, fluidics, and air bearings.

11462 APTIC NO. 27922

Hill, E. T.

LASERS FOR MEASURING SLANT VISULA RANGE. *AGARD Conf. Proc. no. 50: 35-1 to 35-10, Feb. 1970. 19 refs.*

NTIS, DDC: AD701805

The essential features of runways equipped for automatic landings in fogs are discussed. The problem of measurement of the atmospheric extinction coefficient on and below the guide path without physically placing equipment there is particularly stressed The importance of monitoring Slant Visual Range (S.V.R.) and Runway Visual Range (R.V.R.) at civil airports is discussed. The implications of the introduction of Category II landings is emphasized, and problems posed in equipping Category II runways with S.V.R. monitors outlined. The prediction of the 'Visual Sequence' to be experienced by the pilot when landing is considered more important as a landing aid than the prediction of Slant Visual Range alone. The present methods of predicting Visual Sequence are described and their limitations evaluated. The types of instruments monitoring light backscattered from the atmosphere are considered. Certain basic difficulties exist with this type of instrument including providing sufficiently intense light sources, correlating the backscattered signal with atmospheric extinction coefficient over the slant path being monitored, and relating this to the visible region of the spectrum. The laser is the best available source of light for this application and the possibility of utilizing the Raman frequency shifted return signal from nitrogen, rather than the Mie back scattered signal from aerosols, is discussed.

11463 APTIC NO. 28126

Fukui, Shozo

MEASUREMENT OF DELETERIOUS GAS. *(Yugai gasu no sokuteihoho). Text in Japanese. Preprint, Society of Electro-Chemistry, Tokyo (Japan), Kanto Div., 24p., 1971. (Presented at the Seminar on Air Pollution, Tokyo, Japan, Feb. 3-4, 1971, Paper 5.)*

The photometric determination of deleterious gases is considered, as well as the analysis of heavy metals in the atmosphere by an atomic absorption method, and the determination of atmospheric concentrations of organic solvents by gas chromatography. Accordin to the type of gas to be measured, sampling and preparation of test chemical solutions are indicated. Measuring procedures are presented for hydrogen sulfide, sulfur dioxide, ammonia, hydrogen fluoride, nitrogen dioxide, nitrogen dioxide plus nitric oxide, hydrogen chloride, chlorine, oxidants and ozone. The chemical analyses of heavy metals includes the determination of mercury, lead, cadmium, zinc, copper, iron, and manganese. For example, mercury vapor is absorbed in a sulfuric acid potassium permanganate solution and heated slowly for 30 min. A hydroxilamine solution is added to decolor the potassium permanganate, and a stannous chloride solution is added to reduce the mercury. Vaporized by circulating air, the mercury is absorbed by an absorption cell and measured at 253.7 millimicrons. The gas chromatograhic method is introduced for the measurement of acetone, chloroform, carbon tetrachloride, cyclohexene, tetrachloroethane, phenol, and other organic solvents in the atmosphere.

11464 APTIC NO. 28344

Yanagihara, Shigeru

ANALYSIS OF AUTOMOTIVE EXHAUST EMISSIONS. *(Jidosha haiki gasu no bunseki ni tsuite). Text in Japanese. Jidosha Gijutsu (J. Soc. Automot. Engrs. Japan), 25(1):56-62, Jan. 1971. 11 refs.*

Control of waste gas is one of the primary problems with automobile engines. As waste-gas purification techniques progress, the development of better methods of analysis of automobile exhaust emissions is demanded. The bag sampling method for waste gas including total bag sampling, constant volume sampling, and proportional sampling is described. Operating principles and examples of apparatus are given. The total bag sampling method has a high reliability and allows simultaneous analysis of one sample by several instruments, but it needs a very large-volume bag and gives only a time-average value. The condensation of moisture in the bag causes a change in the quantity of nitrogen oxides. To prevent the condensation and the change of constituents, dilution sampling was adopted; the constant volume sampler (CVS) is typical. The CVS is adequate for evaluating the total quantity of waste gas and can be used for any size engine. The total bag sampling and the CVS require large apparatus and cannot be used as a car. To meet this problem, the proportional sampling method was adopted. This method uses a complicated mechanism and does not have as satisfying reliability. For continuous instrumental analysis, the non-dispersive infrared analyzer (NDIR) and the flame ionization detector (FID) are superior. Problems of continuous analysis are considered. The NDIR is used to measure hydrocarbons, carbon monoxide, carbon dioxide, and nitric oxide. The NDIR for automotive exhaust gas has a rapid response and is less influenced by other interfering constituents than the NDIR for industrial use. The constitution of the sampling system and the problems of calibration are mentioned. The NDIR has little sensitivity to aromatic or olefinic hydrocarbons; for measuring total hydrocarbons, the FID is used. The FID can be used at high temperatures (150-200 C) and is desirable for measuring diesel engine waste gas. The FID can detect concentrations under 10 ppm. A simple carbon monoxide concentration analyzer is mentioned. Other analytical methods such as gas chromatography, the measurement of particles, and the measurement of nitrogen oxides are discussed.

11465 APTIC NO. 28360

Malissa, H., R. Kellner, and E. Pell

DETERMINATION OF SMALL AMOUNTS OF SULFUR IN MINERAL OIL PRODUCTS BY MEANS OF OSCILLOMETRY. *(Bestimmung kleiner Schwefelmengen in Erdoelprodukten mittels Hochfrequenztitration). Text in German. Z. Anal. Chem., vol. 253:113-117, 1971. 7 refs.*

A new method is described for determining sulfur in mineral oil products after combustion of the latter in the Wickbold apparatus. The organic matter is burned in a oxyhydrogen flame. The sulfur dioxide generated by combustion is absorbed in 10% hydrogen peroxide solution. Barium acetate is added to the solutions, the change of conductivity is observed with an oscillotitrator. The sulfur content is then determined from a calibration curve. Sulfur concentrations of 0.01% can be determined with this method. The total analytical procedure takes about 5 minutes.

11466 APTIC NO. 28361

Frohofer, H.

MICROANALYTICAL DETERMINATION OF CARBON AND HYDROGEN, (14), TRITIUM AND DEUTERIUM IN A STREAM OF NITROGEN. *(Mikrobestimmung von Kohlenstoff und Wasserstoff, sowie von (14), Tritium und Deuterium im Strickstoffstrom). Text in German. Z. Anal. Chem., vol. 253:97-102, 1971. 17 refs.*

Carbon and hydrogen are the organic substance microanalytically determined by burning in a stream of nitrogen and oxidizing the decomposition products with oxygen. Halogens and sulfur are absorbed by the combustion catalyst, while nitrogen oxides are reduced on a copper surface. The combustion products, carbon dioxide and water, are determined gravimetrically. The combustion apparatus consists of three heaters. The main heater (20 cm long) must be heated to 750 C, the copper oven (10-cm long) to 350 C, and the moveable burner (9-cm long) to between 900 and 1000 C. Oxygen and nitroge are controlled by a magnetic valve and passed through a flow meter into the quartz tube at 10 ml/min. Analyses have an accuracy of plus or minus 0.3% for carbon and plus or minus 0.2% abs for hydrogen. Radioactive samples are approximately absorbed and counted in a liquid scintillation counter; deuterium is determined by infrared spectrometry.

11467 APTIC NO. 28773

Okuda, Norio

CONTINUOUS DETERMINATION SYSTEM OF SMOKE CONCENTRATION. *(Baien nodo renzoku sokutei sochi ni tsuite). Text in Japanese. Taiki Osen Kenkyu (J. Japan Soc. Air Pollution), 5(1):94, 1970. (Proceedings of the Japan Society of Air Pollution, Annual Meeting, 11th, 1970.)*

A new device for measuring stack emissions uses the Ringelmann principle but also indicates effective stack height for the measurement of sulfur dioxide concentration, as expressed by the formula He equals Ho + 0.65(Hm plus Ht). In addition, the device enables measurements at night. The smoke concentration is continuously recorded on a digital indicator, (from degree 0 to degree 5). Measurement intervals are 1 min to 80 sec; when the environmental standards are exceeded, a warning light goes on.

11468 APTIC NO. 28793

Grennfelt, P., A. Akerstrom, and C. Brosset

DETERMINATION OF FILTER-COLLECTED AIRBORNE MATTER BY X-RAY FLUORESCENCE. *Atmos. Environ., 5(1):1-6, Jan. 1971. 5 refs.*

Since the beginning of 1968, the Swedish Institute for Silicate Research has used Millipore filters to collect airborne matter and an X-ray fluorescence spectrometer to determine the elements present in the samples. An account is given of the field sampling and the measuring and calibration techniques employed. Daily means from measurements of manganese, iron, and silicon in the vicinity of Domnarfvets Jernverk, Borlange are presented graphically. The measurements were made during February 1969. (Author abstract modified)

11469 *APTIC NO. 28811*

Dingle, A. Nelson

HAY FEVER POLLEN COUNTS AND SOME WEATHER EFFECTS. Bull. Am. Meteorol. Soc., 38(8):465-469, Oct. 1957. 3 refs.

The standardized gravity slide method of obtaining hay fever pollen counts is examined in light of available volumetric comparisons and meteorological data. Calibration data are reported which show three interesting weather-related sequences of pollen concentration. These are cumulative pollution of air terminated by a flushing-out of the dirty air and its replacement with clean air following a cold front passage; effective rain without an accompanying change of air mass; and an abrupt increase of wind speed. Analysis of the data shows that the gravity count method is useful as a very rough measure of atmospheric pollen concentration only if slid counts can be resolved with simulateousl collected volumetric samples. (Author abstract modified)

11470 APTIC NO. 28816

Mengenhauser, James V.

PROPOSED NUCLEAR MAGNETIC RESONANCE METHOD OF DETERMINING THE AROMATICITY OF HYDROCARBON FUELS. *Army Mobility Equipment Research and Development Center, Fort Belvoir, Va., Mechanical Technology Lab., Task 1J662708D50601, Rept. 1983, 20p., June 1970. 11 refs.*

NTIS, DDC: AD 711892

A new method of determining the aromaticity of hydrocarbon fuels is proposed. This method utilizes nuclear magnetic resonance spectroscopy to measure complexation of acceptor molecules by aromatic hydrocarbon donors in the fuel. Dichloromethane and nitromethane were found to be satisfactory acceptors for this purpose. Equations were developed for the general case of n different aromatic doners, each having a different concentration, equilibrium constant, and complexation shift; and with the assumption of rapid chemical exchange of the acceptor among the n competing donors. For any unknown fuel, the acceptor shift is a precise, reproducible quantity which may be converted to volume per cent aromatics by means of a simple equation. The constants in this equation may be determined by standardization with any aromatic hydrocarbon or with any mixture of aromatics. The method is applicable to any liquid hydrocarbon fuel and, unlike many existing methods, is unaffected by olefins, dyes, and fluorescent compounds. The precision of the shift measurement is typically 0.4 Hz, which corresponds to 0.2 0.5 percent aromatics. (Author summary)

11471 APTIC NO. 28817

Holcombe, C. E., Jr., W. K. Duerksen, R. B. McLees, and O. J. Horne

PREPARATION AND CHARACTERIZATION OF ULTRAFINE PARTICLES FROM MATERIALS OF HIGH HARDNESS. *Union Carbide Corp., Oak Ridge, Tenn., Nuclear Div., Contract W-7405-eng-26, 20p., June 8, 1970. 8 refs.*

NTIS: Y-1723

The methods used at the Oak Ridge Y-12 Plant to prepare and classify ultrafine (less than 10 micron) particles of such hard materials as ceramic aluminum oxide and crystalline boron without contamination are described. Emphasis has been placed on innovations in fluid-energy-mill techniques and improved classification of ultrafine particles by the use of an ultrasonic generator to accelerate the particles through a ten-micron micromesh screen. Collection was accomplished by means of a semicontinuous supercentrifuge. An explosive reduction of particle size was achieved and a study was made of a sedimentation particle-size classifier (0.5 to 10 micron) utilizing shutter valves. (Author summary modified)

11472 APTIC NO. 28818

Duce, Robert A., John T. Wasson, John W. Winchester, and Forrest Burns

ATMOSPHERIC IODINE, BROMINE, AND CHLORINE. *J. Geophys. Res., 68(13):3943-3947, July 1, 1963. 18 refs.*

Iodine, bromine, and chlorine have been determined by means of neutron activation analysis in a series of aerosols and rainwater samples collected in Hawaii. Five-milliliter samples of rain water are used in the analytical procedure, and no chemical treatment is required before pile irradiation. Freedom from errors due to contamination and species-specific chemical steps is thus assured. The iodine/chlorine ratio in the aerosols and rain water is more than 100 times greater than published values for sea water, but the bromine/chlorine ratio is the same as that for sea water within a factor of 2. The seven samples of rain water, collected in October and November 1961, and the eight samples of aerosols, collected from a light aircraft in May 1962, show (1) that I/Cl is greater in rain by a factor of 3, (2) that Br/Cl is greater in rain by a factor of 2, and (3) that I/Br is greater in rain by a factor of 1.5. (Author abstract)

11473 APTIC NO. 28819

Parkinson, Thomas F. and Louis G. Grant

ACTIVATION ANALYSIS OF PARTICULATE AIR CONTAMINANTS. *Nature, 197(4866):479-480, Feb. 2, 1963. 1 ref.*

Typical air samples contain particulate air contaminants in concentrations of 100-2000 micrograms/cu m, but standard methods for analyzing the composition of these contaminants are tedious and often insensitive. Preliminary irradiations of samples collected on filter paper have shown that activation analysis is a fast, sensitive, and highly specific method for inorganic elements. Identification of several radioactive species has been accomplished and quantitative estimates have been made. However, one problem has been that the filter paper as well as the contaminants activate necessitating the irradiation of a control sample to correct for the effect. Beta-activities were measured with a 2-pi proportional counter, and gamma-activities were measured with a single channel pulse height analyzer equipped with a well-type sodium iodide (thallium) crystal.

11474 APTIC NO. 28820

Hansen, Frank V.

A TECHNIQUE FOR DETERMINING VERTICAL GRADIENTS OF WIND AND TEMPERATURE IN THE SURFACE BOUNDARY LAYER. *Army Electronics Command White Sands Missile Range, N. Mex., Atmospheric Sciences Lab., Task 1T061102B53A-17, TR ECOM-5324, 10p., Aug. 1970. 17 refs.*

NTIS, DDC: AD 714366

Based upon the premise that similarity theory represents mean flow conditions in the surface boundary layer, a procedure is outlined whereby paired wind and temperature measurements together with the conjugate laws of the profiles can be used for determining actual gradients and turbulent characteristics.

This approach has a variety of uses including such diverse fields as missile testing, agriculture, air pollution, and diffusion problems in general. Addition of other measurable parameters to the basic gradient measurements, such as net radiation or vapor pressure, allows conclusions to be made concerning evaporation of the radiation and energy balances of the surface boundary layer. (Author abstract modified)

11475 APTIC NO. 28824

Pickett, E. E.

CURRENT CAPABILITIES IN ANALYSIS OF TRACE SUBSTANCES: FLAME PHOTOMETRY AND ATOMIC ABSORPTION. *Missouri University, Columbia, Conf. Trace Substances Environ. Health, 1st, Columbia, Mo. 1967, p. 30-36. 8 refs. (July 10-11.)*

The convenience and ease of flame methods of analysis are due largely to the requirement that samples are introduced into flames as solutions. When sensitivities of atomic absorption and flame emission were compared for 56 elements, seventeen elements were more sensitive by atomic absorption, 15 were about the same, and 24 were more sensitive by flame emission. Improvement of the sensitivity figures is mentioned for both techniques, as well as recent advances in the area of analytical spectroscopy. It is suggested that a major part of the work of the spectroscopist shoul lie in making available to himself a large array of tested chemical separation methods, which he can quickly select and put to use according to the changing needs of his sample load. Contamination problems are mentioned, as well as the use of spectroscopic methods to replace analysis of those elements not ver well done by activation procedures.

11476 APTIC NO. 28826

Dimitriades, Basil

ON THE FUNCTION OF HYDROCARBON AND NITROGEN OXIDES IN PHOTOCHEMICAL SMOG FORMATION. *Bureau of Mines, Washington, D. C., Report of Investigations 7433: 37p., Sept. 1970. 28 refs.*

The roles of hydrocarbons and nitrogen oxides in smog formation were investigated. Samples of automobile exhaust with varying HC and NOx levels were irradiated in a smog chamber under conditions that resulted in smog levels similar to those observed in the atmosphere. The chamber facility included two Beckman 109 analyzers for measurement of total hydrocarbon, two Mast meters for oxidant, and two Beckman K-1008 analyzers for nitrogen dioxide and NOx. Results were used to define the patterns that describe the dependence of a number of smog manifestations of HC and on NOx. Using these dependence data and some simplifying assumptions, estimates were made of the ranges within which HC and NOx must lie in order to obtain specified levels of air quality. (Author abstract modified)

11477 APTIC NO. 28828

Culkowski, Walter M. and Searle D. Swisher

THE ATDL LIDAR PROGRAM. *National Oceanic and Atmospheric Administration, Oak Ridge, Tenn., Atmospheric Turbulence and Diffusion Lab., No. 41, 14p., Dec. 1970. 3 refs.*

A comparatively inexpensive LIDAR system is described, which employ a neodymium type pulsed laser, a simple optical system, and a sensitive photomultiplier detector. The LIDAR was located some 2000 meters from the 950 kw Bull Run electricity generating plant of the Tennessee Valley Authority, which releases an effluent consisting principally of sulfur dioxide and filtered fly ash. Preliminary results are presented of a trace of the plants effluent

11478 APTIC NO. 28829

Lorenz, L. J., R. A. Culp, and L. B. Rogers

ENSEMBLE AVERAGING IN GAS CHROMATOGRAPHY. *Purdue Univ., Lafayette, Ind., Dept. of Chemistry, Contract AT(11-1)-1222, 23p., 1970. 13 refs.*
NTIS: CAEC00-1222-39

Using a high precision gas chromatographic system, ensemble-averaging techniques have been shown to be quantitatively successful when the signal-to-noise ratio of the final data array was greater than two. This lower limit occurred at a methane concentration of 5.8 ppb for a 60 chromatogram ensemble. Ensemble averaging should also be an ideal method for continuous monitoring of trace constituents; one could use a fixed-size ensemble and continually update it by adding a new chromatogram while subtracting the oldest. Such an approach would cut down the time-lag between actual changes and their detection, while also providing much more data about those changes. Solutions are indicated for the effect of fluctuations in the atmospheric pressure on the response of the flame-ionization detector in any averaging process that extends over a long period of time. Approaches to peak sensing are also discussed.

11479 APTIC NO. 28832

Mukai, R., I. Hawryluk, and R. Shapiro

THE MUTAGENIC SPECIFICITY OF SODIUM BUSULIFITE. *Biochem. Biophys. Res. Commun., 39(5):983-988, 1970. 13 refs.*

Reversion studies with Escherichia coli mutants indicate that sodium bisulfite specifically induces mutations in only those mutants identified as cytosine-guanine at the mutant site. Stationary growth phase cultures were used, with strains of E. coli K12 and 15. Five ml of an overnight broth culture were centrifuged and washed once in saline. The washed pellet was resuspended in 5 ml of reaction mixture which was 1 M for sodium bisulfite in 0.2 M acetate buffer at pH 5.2; control samples were resuspended in buffer alone at the same pH. At zero time and after 30 min incubation at 37 deg, sodium bisulfite and buffer were removed by centrifugation, and appropriate aliquots plated for titer and revertent colonies. (Author summary modified)

11480 APTIC NO. 28833

Hayatsu, Hikoya and Akiko Miura

THE MUTAGENIC ACTION OF SODIUM BISULFITE. *Biochem. Biophys. Res. Commun., 39(1):156-160, 1970. 6 refs.*

The mutagenic activity of sodium bisulfite toward phage-lambda is described. The frequency of mutation of the c0c gene of lambda was increased about 10 times as much as that of spontaneous mutation by treatment of the phage with 3 M sodium hydrogen sulfite solution of pH 5.6 at 37 deg for 1.5 hours. Mutagenesis could be related to the cytosine derivative specific reaction of sodium bisulfite. (Author summary)

11481 APTIC NO. 28836

Brar, S. S. and P. F. Gustafson

NEUTRON ACTIVATION ANALYSIS OF AIRBORNE TRACE ELEMENTS IN THE CHICAGO AREA. *Trans. Am. Nucl. Soc., 12(2):485-486, 1969. 2 refs. (Presented at the American Nuclear Society, Winter Meeting, San Francisco, Calif., Dec. 1-4, 1969.)*

Surface air particulates in the Chicago area were collected with cellulose fiber filters on the fourth of April 1968. A portion of each filter was irradiated with thermal neutrons and then subjected to gamma ray spectrometric analysis using a 3 by 3 inch sodium iodide (thallium) crystal. The individual gamma emitters present in the complex spectra were analyzed by computer methods. Concentrations of the elements observed in Chicago area surface air particulates are presented tabularly.

11482 APTIC NO. 28843

Jacobson, Jay S. and Laurence I. Heller

A SIMPLE, RAPID POTENTIOMETRIC METHOD FOR THE ESTIMATION OF FLUORID IN VEGETATION. *Environ. Letters, 1(1):43-47, 1971. 3 refs.*

A new method has been developed for the estimation of fluoride in vegetation, which employs a selective ion electrode for measurement of fluoride obtained by acid extraction from pulverized plant tissue. Current methods for the determination of fluoride in vegetation usually employ high temperature ashing and alkaline fusion, distillation, and analytical measurement of fluoride. These techniques are complex and time-consuming. Leaves of apple, alfalfa, barley, sorghum, several grasses and weed species, and pine needles were analyzed both by potentiometric analysis after extraction and by a standard both by potentiometric analysis after extraction and by a standard method. Statistical analyses indicate a correlation coefficient of 0.988 between measurements obtained by the new and old methods, but evidence of incomplete extraction of fluoride from tissue was found. The experimental procedure for the new technique is indicated.

11483 APTIC NO. 28848

Parker, G. W. and H. Buchholz

SIZE CLASSIFICATION OF SUBMICRON PARTICLES BY A LOW-PRESSURE CASCADE IMPACTOR. *Oak Ridge National Lab., Tenn. Reactor Chemistry Div., Contract W-7405-eng-26, Rept. ORNL-4226, 64p., June 1968. 19 refs.*

Aerosol particles in the submicron range are expected to be release as a consequence of a more or less severe core meltdown in a reacto accident. The behavior of aerosol particles is often explainable exclusively in terms of the laws of mechanics, which invariably include particle size as one parameter. Devices to measure particl size in the submicron region are therefore required; and a simple, passive, nearly foolproof device is particularly desirable. The principle of the cascade impactor is simple. A gas which is carrying particles, is accelerated through a nozzle and impinged on a plate; particles having sufficient inertia (i.e. the large particles) leave the jet stream lines and settle on the plate. Successive stages with jets of increasing velocity remove successively smaller particles. Operation at low pressure increases the mean free path of the gas molecules and the Cunningham correction (for the slip of small particles between gas molecules). This enables one to design a cascade impactor of reasonable jet size which will separate submicron particles. A commercially available (Andersen) impactor, modified for low pressure operation, and an impactor of original design were built, tested and calibrated. Design data and calibration curves are reported. The particle size range separated is from about 0.01 micron to several microns diameter. The original design impactor is assembled and disassembled very simply and employs throw-away impactor plates to facilitate decontamination. (Author abstract)

11484 APTIC NO. 28851

Mick, Stanley H. and John B. Clark, Jr.

WEIGHING AUTOMOTIVE EXHAUST EMISSIONS. *Preprint, Society of Automotive Engineers, Inc., New York, 20p., 1969. 4 refs. (Presented at the Society of Automotive Engineers, Mid-Year Meeting Chicago, Ill., May 19-23, 1969. Paper 690523.)*

For more than a decade, the need for measuring exhaust emissions on the basis of weight of emissions per mile has been known, and the various techniques that have been tried include the proportional sampler, fuel flow with exhaust concentrations, total bags, exhaust flow rate with concentrations, and the recently proposed constant volume sampler. The constant volume sampler flows all of the car's exhaust plus enough dilution air to keep the total flow constant. Since the total flow is constant, the volume of dilution air automatically changes inversely with the exhaust flow rate. One problem with the constant volume sampler is caused by the level of emissions in the ambient air at the test site. To solve the background hydrocarbon emission problem, a large capacity charcoal filter has been installed in the dilution air supply line; a simila correction has been made for background carbon monoxide by passing dilution air from the charcoal filters through the reference cell of the non-dispersive infrared analyzer. The analyzer train is composed of a flame ionization detector for hydrocarbon measurement non-dispersive infrared analyzers for carbon monoxide and nitric oxide, and a non-dispersive ultraviolet analyzer for nitrogen dioxide. Exhaust dilution versus dew point, calculation of mass emission, absolute calibration of the constant volume sampler, the test cycle, cold-to-hot weighting, start-up and shut-down emissions mass emission standards, and various unresolved problems with the sampler are discussed.

11485 APTIC NO. 28852

Griffiths, John F., Malcolm M. Pendergast, D. Randerson, R. C. Runnels, R. Michael Ryan, John C. Thomas, and James T. Zumwalt

A TIME AND SPACE STUDY OF POLLUTANTS. (FINAL REPORT). *Texas Agricultural and Mechanical Univ., College Station, Proj. AP-00611, 144p., Feb. 26, 1971. 33 refs.*

A series of papers are presented constituting the final report on an investigation of air pollution and related meteorological parameters in selected urban industrial complexes. A technique was developed for estimating the lower winds (winds up to about 2000 meters) over Houston, Texas, from the currently existing upper air station at Lake Charles, Louisiana. Spatial vector regression, a seldom used statistical technique, was employed. The areal and temporal distribution of pollutant emissions from vehicles in Houston were estimated. A numerical model was proposed for predicting the dispersion of sulfur dioxide over Nashville, Tennessee, during the winter. The model includes the effects of three-dimensional advection, diffusion, and variations in the topography, as well as the effects of chemical decay, source strength, and a correction term for the truncation error. Carbon monoxide measurements were made in the vicinity of a freeway interchange in Houston and in a downtown region of the same city. Activation analysis was used to reveal the distribution of manganes and bromine in an urban area. The spectral distribution of solar radiation in a polluted and a clean air mass was compared. Some preliminary results are presented of an investigation of the dispersion of atmospheric pollutants and the associated pattern of temperatures within the urban area of

Houston. An airborne survey was made over Houston to obtain infrared pictures, ultraviolet measurements, infrared data, and temperature profiles. A number of pollutants were tabulated for 55 cities.

11486 APTIC NO. 28853

Reiter, Reinhold, Rudolf Sladkovic, and Walter Carnuth

ATMOSPHERIC AEROSOLS BETWEEN 700 AND 3000 M ABOVE SEA LEVEL. PART IV. (FINAL REPORT). *Fraunhofer-Gesellschaft, Garmisch- Partenkirchen (West Germany), Contract DAJA-37-69C-1357, 106p., July 1970. 38 refs.*

Technical details are described of telemetry systems which permit, by means of cable cars, the recording of profiles of temperature, humidity, wind, air conductivity, and potential gradient, against pressure as a parameter of altitude, up to 3000 m above sea level. From the profiles of air conductivity the vertical mass exchange coefficient is calculated as a function of altitude (in small incremental intervals). The following factors enter into the computation: the ion production rate as a function of altitude, the concentration of Aitken nuclei, and the coagulation rate in the Aitken nuclei particle size range, as recorded at several stations. All numerical computation methods, and the theoretical elements upon which they are based, are stated. Examples demonstrate the effectiveness of the method: control of the vertical aerosol exchange through several single and multiple temperature layers situated at various altitudes, their fine structure being related to the fine structure of the altitude dependence of the exchange coefficient; structure of the upper boundary of the exchange layer in relation to aerosol transport and aerological strudure; action of wind shear upon aerosol transport. The measured data are statistically evaluated from various aspects. The vertical exchang coefficient is presented as a function of temperature and humidity gradient. The relationship, however, belongs to a different type depending on whether it is the aerosol exchange through barring layers and other layers with typical aerological structures that is considered, or inside the region of a layer with normal moist or dry adiabatic gradients. Influences of the diurnal variation of solar irradiation, or advective processes, and particularities in formation or dissipation of aerologic structures are demonstrated. (Author abstract)

11487 APTIC NO. 28856

Romans, H. B. and H. L. Craig, Jr.

ATMOSPHERIC STRESS CORROSION TESTING OF ALUMINUM ALLOYS. *In: Meta Corrosion in the Atmosphere. Am. Soc. Testing Mater. Spec. Tech. Publ., no. 435-61:82, 1968. 4 refs. (Presented at the American Society for Testing and Materials, 70th Annual Meeting, Boston, Mass., June 25-30, 1967.)*

Stress corrosion studies were carried out on a number of aluminum alloys at Aruba, Netherlands, Antilles, Kure Beach, N. C., and Richmond, Va. These sites provided environments that ranged from tropical marine to mild industrial. Failure times are compared wit laboratory and service results. One aim was to study the effect of prolonged aging at ambient temperatures. In aluminum-magnesium alloys this aging may produce a metallurgical structure which makes these alloys subject to stress corrosion cracking. Specimens aged at higher temperatures do show this response in laboratory and atmospheric tests. From these accelerated data, Arrhenius plots predict these alloys should become susceptible within two to five years if aged at ambient temperatures. However, test results do not bear this out. It is possible to draw erroneous conclusions from only one type of test. For at least one alloy, the rate of failure is much more rapid in the atmosphere than in an accelerated laboratory test. This has been attributed to an interaction betwee specimens tested in a communal solution. In conclusion, either a laboratory or an atmospheric test is, in itself, insufficient to characterize the stress corrosion behavior of an engineering material. These two tests give data that are complimentary instead of supplementary. Both types are necessary to evaluate the potential hazards of a material having some degree of stress corrosion susceptibility. (Author abstract)

11488 APTIC NO. 28864

McCord, Carey P., Gordon C. Harrold, and Stuart F. Meek

A CHEMICAL AND PHYSIOLOGICAL INVESTIGATION OF ELECTRIC ARC WELDING. J. Ind. Hyg. Toxicol., 23(5):200-215, May 1941. 19 refs. (Presented to the American Industrial Hygiene Association, Pittsburgh, Pa., May 7, 1941.)

Rabbits and albino rats were exposed to the gases and fumes from ar welding 6 hours daily for 46 exposure days in a total of 65 days. Components which appeared in the rod coating are indicated, as well as the quantities of gases evolved and the amount of metallic fumes These include oxygen and carbon monoxide concentrations, ozone concentrations, nitrous gases, iron fumes, manganese, silicon dioxide, titanium dioxide, calcium oxide, and magnesium oxide. Contrary to findings from bare rods, growth rate disturbances were encountered, chiefly in rats for which the cause is unknown. After exposure to 'welding fume' ceases, the iron pigment deposited in lung tissue migrates through the lymphatics to the tracheobronchial nodes. Methemoglobin concentrations ranging from 21.7 to 4.5% were found, with an average of 15% for the males and 11.2% for the females. Four days after exposure had ceased the methemoglobin concentrations had dropped to a 2.6% average for the males and 2.0% for the females. Determination of methemoglobin in a number of welders showed no values over 3% with the majority averaging 2.5%. However, it is believed that the determination of methemoglobin in workers exposed to nitrous gases will present some evidence of exposure to welding fumes.

11489 APTIC NO. 28895

Loftin, H. P., C. M. Christian, and J. W. Robinson

THE CONTINUOUS DETERMINATION OF LEAD IN AIR. *Spectrosc. Lett., 3(7):161-174, 1970. 45 refs.*

A new atomic absorption technique for determining lead in the atmosphere achieves increased analytical sensitivity by utilizing hot carbon rods to reduce lead compounds to the atomic state and by taking advantage of long path absorption tubes to accumulate atoms in the light path. In this method, air samples are continuously passed over the white-hot carbon rods. The neutral atoms are then passed into the heated absorption chamber, where their concentration is measured. The lower limit of sensitivity of the method was observed to be about 3 times 10 to the minus 11th power g of lead. The method appears to be applicable to a wide variety of metals and their determination is currently under investigation.

11490 APTIC NO. 28903

Polevitskiy, K. K., and Ye. N. Shadrina

AUTOMATIC NEPHELOMETER. *(Avtomaticheskiy nefelometr). Text in Russian. Tr. Gl. Geofiz. Observ. (Leningrad), no. 40:85-94, 1969. 15 refs.*

An automatic nephelometer with a fixed (45 deg) angle of measurement, and employing a dual-beam differential-null photometer, is described. This instrument, intended for measuring meteorological visibility range, is capable of measuring light intensity with a relative error of about 2% over an almost unlimited measurement range. Measurement is made across an open volume of air, and visibility range is continuously recorded on a log scale. The instrument may be operated both with and without the presence of sunlight. Both the optical scheme and electronics are presented and discussed.

11491 APTIC NO. 28904

Goryshin, V. I.

CERTAIN RESULTS FROM LABORATORY AND FIELD TESTS OF THE RDV-1 AUTOMATIC PHOTOMETER FOR MEASURING AND RECORDING ATMOSPHERIC TRANSPARENCY. *(Nekotoryye rezul'taty laboratornykh i polevykh ispytaniy avtomaticheskogo fotometra dlya izmereniya i registratsii prozrachnosti atmosfery (RDV-1)). Text in Russian. Tr. Gl. Geofiz. Observ. (Leningrad), no. 213:59-69, 1968. 1 ref.*

The RVD-1 automatic compensating photometer was demonstrated to have a photometric error of not more than plus or minus 1% under field conditions with temperature variable from -40 to +40 C, and not more than plus or minus 2% with temperatures ranging from -50 to +50 C. Error introduced by the data transmission link does not exceed 0.5% of the full-scale transparency value. Data from both laboratory and field tests are tabulated.

11492 APTIC NO. 28907

Kudachkov, P. A.

REGARDING PRODUCTION OF INSTRUMENTS FOR DETECTING AIR POLLUTION. *(O vypuske priborov dlya opredeleniya zagryaznennosti vozdukha). Text in Russian. Gaz. Prom., no. 1:29, May 1956.*

Production in 1956 of the following instruments is announced: (1) UG-1 universal portable gas analyzer suitable for detecting hydrogen sulfide at 0.002-0.35 mg/l, chlorine at 0.002-0.25 mg/l, ammonia at 0.002-0.30 mg/l, gasoline vapors at 0.2-30.0 mg/l, and benzene vapors at 0.1-2.0 mg/l with a 10-15% error; (2) KU-1 conductometric device for detecting carbon dioxide at 0-0.8, 0-3, and 0.20 mg/l, carbon monoxide at 0-0.5 and 0-2 mg/l, and gasoline vapor at 0-6 mg/l, and; (3) GB-3 portable gas analyzer for rapid (30-60 sec) detection of explosive concentrations of gasoline vapor (both ethylated and non-ethylated) in the ranges 0-30 and 0-150 mg/l with a 5% error.

11493 APTIC NO. 28909

Iblev, L. S., G. N. Krasnoshchekova, G. P. Panova, and O. M. Surikov

EXPERIMENTAL METHODS OF INVESTIGATING ATMOSPHERIC AEROSOLS. I. METHODS OF SAMPLING AND ANALYSIS. *(Eksperimental'nyye metody issledovaniya atmosfernogo aerozolya. I. Metody zabora i analiza prob). Text in Russian. Probl. Fiz. Atm., no. 6:63-77, 1968. 15 refs.*

Applications and principles of operation of various air samplers are reviewed, including sedimentation instruments, Laskin cascade impactors, Leningrad State University three-stage impactor, continous sampling impactor, Konifug I and II, aerosol spectrometer, membrane filter, thermoprecipitator, and Electroprecipitator I and II. The relative merits of optical versus microphysical (e.g. optical and electron microscopy, and neutron-activation analysis) analysis of aerosols are also examined. The need for standard equipment and methods in order to make microphysical studies effective and reliable is noted.

11494 APTIC NO. 28913

Robinson, James W.

A FLAMELESS ATOMIC ABSORPTION METER FOR THE CONTINUOUS AIR MONITORING PROJECT. MONTHLY REPORT. *Louisiana State Univ., Baton Rouge, Dept. of Chemistry, Contract CPA 70-176, 2p., Oct. 1970.*

A list is given of the apparatus to be used in constructing a flameless atomic absorption meter for the continuous monitoring air pollutants.

11495 APTIC NO. 28917

Yagoda, Herman and F. H. Goldman

ANALYSIS OF ATMOSPHERIC CONTAMINANTS CONTAINING NITRATE GROUPINGS. *J. Ind. Hyg. Toxicol., 25(10):440-444, Dec. 1943. 6 refs.*

A method for the colorimetric determination of the aliphatic nitrate esters in biological fluids has proven of utility in the estimation of traces of nitroglycerine, pentaerythritol tetranitrate, oxides of nitrogen, and ammonium nitrate in air samples. The basic reaction involves the primary formation of nitric acid and the quantitative nitration thereby of m-xylenol to 5-nitro-4-hydroxy-1,3-dimethylbenzene. The latter is readily volatilized and can be detected in the distillate by making alkaline with sodium hydroxide. The resultant deep-yellow solution obeys Beer's law and permit the quantitative estimation of the nitrate compound in the sample.

11496 APTIC NO. 28925

Clamann, Hans G.

PHYSICAL AND MECICAL ASPECTS OF OZONE. *In: Physics and Medicine of the Atmosphere and Space, New York (?), John Wiley, 1960, Chapt. 9, p. 143-156. 34 refs.*

Ozone is discussed in terms of its physical and spectral properties, distribution in the atmosphere, analysis, and physiological effects. It is noted that the atmospheric ozone concentration will be smaller than 1 ppm below 30,000 ft, will reach a peak of 4 to 6 ppm at 80,000 to 90,000 ft, and will fall below 1 ppm again above 114,000 ft. On the ground, ozone concentrations may be of the magnitude of 0.01 ppm. Of methods of analyzing ozone, that based on detection of free iodine by the amperometric method seems very promising. This method in combination with transistorized amplifiers and telemetering transmitters opens a way to recording of ozone in flight at high altitudes in short intervals. Vital capacity in human subjects exposed for 1 hr to 6 ppm ozone has been reduced to 57.7% that of normal. A subject exposed for 2 hr to 2 ppm ozone showed a 13% reduction in vital capacity. The soft tissue of the respiratory tract seems to be the only tissue attacked by ozone. Although no danger appears to be involved in the application of ozone in the field of water pollution, or as an oxidizer in industry, ozone can no longer be considered a desirable addition to conditioned air.

11497 APTIC NO. 28934

Lucas, D. H.

ROUTINE MONITORING. *In: Gas Purification Processes. G. Nonhebel (ed.), London, George Newnes Ltd., 1964, Chapt. 14, Part D, p. 661-682. 9 refs.*

Developments in the nature and detailed design of monitoring instruments for particulate matter in flue gas are presented. One group of instruments monitors the visibility of the plume and is relevant to complaints of obscured sky and loss of sunlight; it is sensitive to fine particles, and, if well designed, is appropriate for the control of smoke emission. The advantages of various types of photocells are presented. Methods of measuring th optical density of flue gas inside and outside the chimney are diagrammed. A solution to the problem of keeping observation windows from being obscured by smoke is suggested. The second type of instrument monitors the nuisance value of dust and grit and is relevant to complaints of obscured windows, paint and laundry, and deposits of grit; it is sensitive to coarse particles. Various types of dust monitoring instruments discussed include the optical dust monitor, the dust-collecting thimble, an electrostatic dust monitor, and an instrument for measuring dust by electronic charges produced by friction. The use of the Ringelmann chart and its advantages and disadvantages are also presented. (Author summary modified)

11498 APTIC NO. 28935

Little, A.

SIZE ANALYSIS OF DUST. *In: Gas Purification Processes. G. Nonhebel (ed.), London, George Newnes Ltd., 1964, Chapt. 14, Part C, p. 622-661. 24 refs.*

Techniques for size analysis are described including sieving (for particles in the range 75-1000 microns), air elutriation, sedimentation, and optical microscope. A table for the amount of sample required for each type of equipment is given and methods of sub-dividing the sample are discussed. A conversion chart for sieve apertures is given, relating American, French, and German standards to British Standard 410. Tolerances for British Standard Fine Special Test Sieves are tabulated. Hand and mechanical sieving processes are described and evaluated. For analysis by air elutriation, the concept of the equivalent sphere is explained. Three types of air elutriators include the Gonell elutriator, the miniature elutriator, and the Roller particle size analyzer. For the sedimentation technique, suitable suspending media and dispersing agents are required; the more common liquids are tabulated. Sedimentation equipment, including X-ray type, is evaluated, and the range of materials successfully size analyzed by the X-ray apparatus is listed. Size analysis by optical microscope is discussed briefly; there are many variations in practice on the general method, depending on the equipment used. A brief mention is made of each of the following miscellaneous techniques for size analysis: air elutriation of agglomerated dust; sedimentation in air; electron microscope; water elutriation; automatic particle size analyzers; and light extinction techniques. The relative use of size analysis equipment is tabulated for the past ten years. A method for evaluating size analysis apparatus is briefly described. Tables of free-falling speeds covering the size ranges particularly important in gas purification are given which allow easy interpolation and are sufficiently accurate for most purposes.

11499 APTIC NO. 28936

Brown, E. L.

FLUE GAS DUST SAMPLING. *In: Gas Purification Processes. G. Nonhebel (ed.), London, George Newnes Ltd., 1964, Chapt. 14, Part B p. 601-621. 2 refs.*

Problems of measurement of the dust content of the gases from large power station boilers are affected by the nature of the dust, the large quantities of gas involved, and the gas moisture and sulfur trioxide contents. Apparatus used for sampling flue gases consists of a nozzle, a probe, a filter for extracting dust, and a means for measuring the volume of gas sampled. The choice of proper equipmen is discussed. The calculations required before and during a test are the position of each sampling point, choice of nozzle size, and sampling rate. The information available directly from the flue ga sample is the weight of dust collected, the volume of gas sampled, the volume of gas flowing in the flue, and the various conditions obtained during the test. From this information, calculations are made in order to express the results for dust emission, determination of efficiency of the dust collector plant, and for comparison with other conditions and other plants. Problems in oil firing are discussed. Special precautions concerning the safety of personnel and equipment, the choice of test site, procedures, and calculations are noted. The method for making quick investigatory tests is explained.

11500 APTIC NO. 28940

Warneck, Peter

TECHNIQUES APPLICABLE TO MASS SPECTROMETRY OF GASEOUS TRACE CONTAMINANTS. *GCA Corp., Bedford, Mass., Technology Div., Contract NAS12-641, Rept. GCA-TR-70-5-N, 39p., June 1970. 7 refs.*

NTIS: N70-40231

The principal aim of the present investigation of charge transfer mass spectrometry was to separate the charge transfer chamber and the primary ion source by the interposition of a differentially pumped gap so that the interaction of the sample gas with the primary ion source is eliminated. The results obtained with this modified ion source arrangement indicate that the ionization of sample gas by a direct interaction with the primary ion source is greatly reduced, in accordance with expectation. Because the gap installation was made by modifying existing apparatus, the pumping efficiency available was not optimized and some residual interactio of sample gas with the fringes of the discharge in the gap region had to be tolerated. This unwanted type of ionization no longer had any effect upon the type of charge transfer mass spectra observed, but it resulted in a residual ionization of nitrogen, which covers the mass number 28 peak and interferes with the detection of carbon monoxide. In addition, it was found that an ionic species generated in the discharge, probably metastable excited krypton ions contributes to the ionization of nitrogen. Th mass spectrometric sensitivity of the charge transfer method for carbon monoxide was found to be about an order of magnitude less than expected. These factors preclude the descrimination of less than 0.0005 parts of CO in nitrogen at the present stage of development. If krypton ions are retained as the major primary type of ions for the measurement of CO, a mode of operation of the discharge primary source or another type of ion source will have to be found which minimizes the generation of electronically excited, metastable krypton ions. For the study of hydrocarbons it appears from the few examples investigated that primary ions having an average recombination energy lower than that of krypton ions would be preferable on account of the reduced fragmentation expected to occur in the charge transfer mass spectra of such compounds. (Author conclusions)

11501 APTIC NO. 28943

Cholak, J.

THE ANALYSIS OF TRACES OF BERYLLIUM. *A.M.A. Arch. Ind. Health, 19(2):205-210, Feb. 1959. 27 refs.*

The reliability of the existing methods for determining trace quantities of beryllium is discussed, and some data are presented which deal with its occurrence in nature. Three general methods, colorimetric, fluorimetric, and spectrographic, are being used for the determination of traces of beryllium in a variety of materials. The useful lower limit for the colorimetric methods is between 1 and 2 microgram, while the practical lower limit for the morin procedure, the most sensitive fluorimetric method, is between 0.01 and 0.02 microgram. None of the dyes used in the chemical methods is specific for beryllium, so it has been necessary to evolve special methods in order to eliminate interferences by the many ion which occur regularly in biological material. No difficulty is encountered in detecting as little as 0.0005 microgram of beryllium with the spectrographic method. Sensitivity and size of the sample necessary for spectrographic analysis are indicated. The significance of the detection of beryllium in tissues and body fluids depends partly upon the nature, severity, and time of occurrence of exposure, the nature of the disease, and the pattern of the distribution of beryllium. Beryllium concentrations are indicated for samples of earth crust, soil, coal, air, urine and blood, and lung.

11502 APTIC NO. 28966

AIR POLLUTION. *In: Peaceful Uses of Earth-Observation Spacecraft, Vol. II: Survey of Applications and Benefits. Michigan Univ., Ann Arbor, NASA Contract NASW-1084, NASA CR-587, p. 141-151, 158, 159, Sept. 1966. 23 refs.*
NTIS: N66-37029

There is presently no large-scale coverage of air pollution throughout the world or even over sizable urbanized areas of the U. S. Little or no information seems to be available concerning the influence of weather patterns, diurnal cycles, and seasonal cycles on large-scale patterns of pollutants and particularly on local saturation and subsequent atmospheric dispersion of the contaminants. It is proposed that large areas could be monitored for such information by using spacecraft as a platform for pollutio detection devices. Based on data obtained from the TIROS II meteorological spacecraft, which contained instruments for monitoring solar radiation, ozone appears to be a promising tool for monitoring air pollution. Specifically, zones of enhanced radiation due to pollution could be detected from absorption measurements in the 8-12 micron region that includes ozone emissions.

11503 APTIC NO. 28974

Garland, J. A. and J. B. Rae

AN INTEGRATING NEPHELOMETER FOR ATMOSPHERIC STUDIES AND VISIBILITY WARNING DEVICES. *J. Sci. Instr., 3(4):275-280, April 1970. 12 refs.*

An integrating nephelometer is described that uses a feedback circuit to maintain constant sensitivity over long periods of automatic operation. The instrument was developed for an air pollution survey program where data would be logged automatically and instruments would receive attention not more than once a month. Field trials showed that the nephelometer gives a useful estimate of visual range in haze, though its performance in thick fog is expected to be less precise. Since the instrument measures the scattering coefficient at a point, it is well suited to air pollution studies where other properties of the atmosphere are also measured at a point and where atmospheric properties may vary rapidly with position. Calibration by the method of diffusely reflecting disks is preferred to Rayleigh scattering, as no wavelength correction is required. However, corrections are necessary for the finite size of the diffusing screen and its departure from Lambert's Law. (Author conclusions modified)

11504 APTIC NO. 28982

Goecke, Dieter

ACOUSTIC GAS ANALYSIS THROUGH MEASUREMENT OF SOUND DISPERSION, PART I - FUNDAMENTALS - PROPERTIES. *(Akustische Gasanalyse durch Messung der Schalldispersion, Teil I - Grundlagen-Eigenschaften). Text in German. Arch. Techn. Messen, V7232(1):19-22, Feb. 1971.*

The speed of sound can be calculated with great accuracy not only in the ideal gas but also in a real gas. Therefore, sound dispersion and sound absorption can be used along with infrared absorption, heat conductivity, and paramagnetism for gas analysis. For acoustic gas analysis, the relative concentration error is estimated to be less than plus or minus 0.4%. The speed of sound is relatively independent of pressure; it is a function of the square root of temperature. A frequency dependence occurs only at sound frequencies above some 100 kHZ/ATM in clean gases and is shifted to higher frequencies at the smallest concentration of other gases. The curves representing the functional dependency of the sound velocity of the mol or mass fractions are usually concave or convex. If a large measuring rang over the mass fractions, or a high initial sensitivity for mol fractions is desired, then it is advantageous to measure velocity of sound. A more linear relationship can be obtained by measuring the round trip time of sound in those cases for which a large measuring range over the mol fractions or a large final sensitivity for mass fractions are demanded.

11505 APTIC NO. 28984

OPTICAL RADAR METHOD FOR DETERMINATION OF AIR POLLUTION. *(Optisches Radar-Verfahren zum Erfassen der Luftverschmutzung). Text in German. VDI (Ver. Deut. Ingr.) Z. (Duesseldorf), 113(5):375, 1971.*

The laser-Raman-radar-method has been suggested for use in air pollution monitoring. The Raman effect causes the occurrence of spectral lines in the scattering light of molecules which have another frequency than that of the impinging photons. The structure of the scattering molecules determines the frequency shift which provides information on the type of the scattering center. This is particularly true for diatomic molecules, such as oxygen and nitrogen, present in the atmosphere. A ruby laser serves as the radiation source and a telescope as the radiation receiver. For recording the two signals corresponding to Rayleigh and Mie scattering (no frequency shift) and the scattering light components (frequency shift, Raman scattering), a two-beam oscilloscope is used.

11506 APTIC NO. 28988

Gadsen, J. A., J. Parker, and W. L. Smith

DETERMINATION OF CHRYSOTILE IN AIRBORNE ASBESTOS BY AN INFRA-RED SPECTROMETRIC TECHNIQUE. *Atmos. Environ., 4(6):667-670, Nov. 1970. 3 refs.*

A new method of determining chrysotile in airborne asbestos using infrared absorption at 2.72 micrometers is described. The method entails ashing deposits collected on Millipore filters for approximately one hr at 450 C, then incorporating the residue in a potassium bromide disc. The amount of chrysotile present is then determined from the infrared spectrum with the aid of 2 calibration graph. The technique is rapid, simple, and allows detection of chrysotile down to about 20 microgram in the sample, provided that serpentine materials of related structure (e.g., Kaolinite) are absent.

11507 APTIC NO. 28990

Varanasi, P.

LINE-WIDTH MEASUREMENTS ON CO IN AN ATMOSPHERE OF CO2. *J. Quant. Spectr. Radiative Transfer, 11(3):249-253, March 1971. 15 refs.*

Line-width measurements were performed in the fundamental and the first-overtone bands of carbon monoxide broadened by carbon dioxide. The half-widths vary from 0.123 plus or minus reciprocal cm reciprocal atm for m equals 1 to 0.464 plus or minus 0.002 reciprocal cm reciprocal atm for m equals 18 in both the bands. Comparison with self-broadened and nitrogen broadened half-widths indicates that, due to its larger quadropole moment and heavier mass, CO2 is more effective for low m, and less effective for large m, than CO and N2 in broadening of CO lines. Excellent agreement is obtained between the measured width and line widths calculated according to Anderson's theory. (Author abstract modified)

11508 APTIC NO. 28991

Reigel, Stanley A. and Charles W. Gruber

SOILING POTENTIAL--A PROMISING TECHNIQUE FOR EVALUATING PLUMES FROM FOSSIL FUEL COMBUSTION. *J. Air Pollution Control Assoc., 21(4):214-217, April 1971. 7 refs.*

The 'Soiling Potential' technique for evaluating fossil fuel combustion plumes in quantitative units is explained by examples and test results. This technique is based on measuring the light reflected by solids and expressed the soiling potential in terms of the Rud (Reflectance unit of dirt) unit, which is defined as tha quantity of light scattering solids producing an optical density of 0.01 when measured by light reflectance. The method involves passing diluted combustion gas through a tape filter and measuring the deposited spots by means of a photo-reflectance meter. The soiling potential of the emission is calculated in terms of Rud-sq ft/cu ft of stack gas, Rud-sq ft/lb fuel, and Rud-sq ft/Btu input. The technique may serve as a valuable tool in emission inventory programs since it is a reproducible method for assessing the degradation of the soiling index of the ambient air resulting from fossil-fuel combustion.

11509 APTIC NO. 28994

Axelrod, Herman D., Ronald J. Teck, and James P. Lodge, Jr.

FURTHER STUDY ON PREFILTER INTERFERENCE FOR SULFUR DIOXIDE MEASUREMENTS. *J. Air Pollution Control Assoc., 21(4):218, April 1971. 5 refs.*

Data is presented on the effect of various prefilters on sulfur dioxide sampling in Denver. The prefilters used were Nuclepore 0.8 and 2.0 micron, Gelman Type A glass fiber (flash fired) and Type E glass fiber (organic binder), and Mine Safety Appliance glass fiber (flash fired). Each filter was attached to a bubbler. With the exception of the Nuclepore filters, all prefilters removed incoming SO2. As the SO2 concentration decreased, the percent loss increased to almost 100%.

11510 APTIC NO. 28995

Huygen, C.

THE USE OF NITROGEN DIOXIDE PERMEATION TUBES. *Atmos. Environ., 5(1):55, Jan. 1971. 3 refs.*

Conditions are described under which fluorinated ethylene propylene (FEP) polymer permeation tubes can be used for absolute nitrogen dioxide calibrations. Although NO2 is not completely inert to FEP, formation of nitric oxide appears minimal at a high permeation rate (about 10 micrograms reciprocal min) and when the carrier gas is dry air or dry nitrogen. Also, the tubes must be kept dry if they are transported. A small amount of reaction products should not have much influence on the validity of the calibration.

11511 APTIC NO. 28998

Bocksch, Guenther

WAYS OF RATIONALIZING THE CONTROL OF MINE VENTILATION WHEN USING METAL SAMPLING TUBES BY CHANGING THE SAMPLING METHOD AND BY SIMPLIFYING THE ANALYTICAL EXAMINATION OF MINE AIR SAMPLES. *(Wege zur Rationalisierung in der Wetterwirtschaft bei Verwendung von Metallproberohren durch Aenderung des Verfahrens zur Probenahme von Grubenwettern und Vereinfachung der Grubenwetteruntersuchung). Text in German. Bergbauwissenschaften, 18(2):53-59, 1971. 3 refs.*

Changes in the sampling technique of mine air samples and of their analytical examination are proposed. Instead of the hitherto used two valve glass sampling tube a 30 ml single valve metal tube should be used. Before the actual sampling the metal tubes should be rinsed three times with clean air at a 4-6 atm air pressure. This should take place in the laboratory because no reliance can be placed on the procedure being strictly observed at the site of sample taking in the mine. Experiments have disclosed that a sample tube with 2.5 vol % CH4 will by the above procedure be filled with air containing less than 0.02 vol % CH4. All sampling tubes upon delivery from the mine into the laboratory must be checked for their excess pressure which should be recorded. The tests should be made within 4 days. The analytical results should be rounded out to the nearest 0.1 vol % CH4. Greater accuracy is not required and would considerably prolong testing time.

11512 APTIC NO. 29000

Prinz, Bernd and Heinrich Stratmann

THE APPLICATION OF STATISTICAL METHODS IN THE TESTING OF MEASURING METHODS. *(Anwendung statistischer Methoden bei der Pruefung von Messverfahren). Text in German. Staub, Reinhaltung Luft, 31(2):69-71, Feb. 1971. 5 refs.*

Two statistical methods are described to test measuring methods for their cross channel sensitivity and for their variances as a function of the measured value. Both methods are based on the principle of double analysis. Through the application of the first method, resembling the testing of a hypothesis, conclusions can be drawn about disturbances systematically affecting a measuring method. The finding is supplemented by an estimation of individual variance components constituting the total variance of the measured values. The two objective statistical methods were applied to 78 experimental measurements of carbon disulfide by a newly developed test method and the variance as a function of the measured values was determined.

11513 APTIC NO. 29011

Kubie, Gustav

A NOTE ON A TREATMENT OF IMPACTOR DATA FOR SOME AEROSOLS. *J. Aerosol Sci., 2(1):23-30, Feb. 1971. 10 refs.*

A procedure is suggested for estimating the distribution parameters of log normal aerosols from cascade impactor data.

By expressing the individual stage collection efficiency curves by power series in particle size, the corresponding percentage deposits of aerosol particles can be plotted as functions of geometric mean particle size with geometric variances as parameters. From graphs indicatin the dependence of geometric variance on geometric mean particle size for experimentally established percentage deposits on individual stages of a cascade impactor, the aerosol size distribution parameters can be estimated. The properties of a single impactor stage whose collection efficiency is approximated by log normal distribution function are discussed. (Author abstract modified)

11514 APTIC NO. 29016

Edelbeck, Lucy and Philip W. West

DETERMINATION OF TRACE CONCENTRATIONS OF BARIUM EXTRACTED FROM AQUEOUS SYSTEMS. *Anal. Chim. Acta, vol. 52:447-453, 1970. 14 refs.*

A sensitive and reliable method for trace determination of barium i aqueous systems is described. By combining the solvent extraction of barium hexafluoroacetylacetonate into isoamyl acetate with subsequent determination by atomic absorption spectrophotometry, the method increases by 50% the best sensitivity previously attained. Barium concentrations as low as 0.015 micrograms reciprocal ml are rapidly determined with a sensitivity of 0.005 micrograms reciprocal ml for 1% absorption. The use of a high concentration of potassium ion in the aqueous system improves the sensitivity. The potassium is coextracted with the barium and acts to suppress the ionization and enhance the absorption of barium. Interference effects of 55 diverse ions were studied, and their tolerance levels are summarized. No significant interference effects were found. (Author summary modified)

11515 APTIC NO. 29018

Yauchi, Shiro

DEVELOPMENT OF SULFUR METER FOR PETROLEUM. *Chem. Economy Eng. Rev. 3(1):37-45, Jan. 1971.*

The construction and performance of a high-accuracy petroleum sulfur analyzer (the Y/G sulfur analyzer) are reviewed. The detector consists mainly of a sample cell, a radiation source, and an ionization chamber. The radiation source emits a gamma-ray whic hits the hemispheric target of a special metal, whereupon a characteristic X-ray of about 20 keV is emitted in a secondary radiation. The ray goes through the sample cell and is detected in the ionization chamber. The signal from the chamber is then compared with reference signals from a density meter and the difference fed to a sulfur convertor. The analyzer performed satisfactorily during four months of field testing in a fuel oil blender and a hydrogenation direct desulfurizer for petroleum refining. Within 0.02 wt% sulfur could be measured at the calibration frequency of once a month.

11516 APTIC NO. 29020

Kuempel, J. R. and W. D. Shultz

AN ELECTROCHEMICAL MONITOR FOR AIR POLLUTANTS. *Anal. Letters, 4(2):107-116, Feb. 1971. 7 refs.*

A thin-layer electrochemical cell was developed as a detector for air pollutants and tested with sulfur dioxide-air and chlorine-air mixtures. The cell gives well-defined, reproducible signals proportional to pollutant concentrations down to 20 ppb. Two electroanalytical procedures are described for monitoring or sampling polluted air with the cell: (1) a controlled-potential experiment in which the current time response of the cell is relate to pollutant concentration, and (2) an experiment similar to stripping analysis in which pollutants are first accumulated at an electrode surface under controlled potential conditions, and then analyzed voltammetrically. (Author abstract)

11517 APTIC NO. 29030

Pattison, John N.

INSTRUMENTS FOR RESEARCH AND PROCESS CONTROL. *Environ. Control Safety Management, 140(5):29-31, Nov. 1970. (Presented at the National Pollution Control Conference, Annual, 3rd, San Francisco, Calif.)*

At present, most air pollutant analyses are made by automatic wet chemical methods the reaction time of which is not adequate for process control. The measurement of physical properties hold much more promise. Some of the techniques that are especially promising are absorption and emission spectroscopy, fuel cells, specific ion electrodes, and mass spectroscopy. Recent developments in tunable lasers, photoelectric detectors, integrated circuits, and midget computers will probably find application for emission control systems during this decade. Flame ionization hydrocarbon analyzers and non-dispersive infrared analyzers have some of the desired capabilities and can be considered to represent the first generation of process control instrumentation. Instruments suitable for process control of the major gaseous pollutants may become available in the early 1970's However, no rapid specific analyzers for particulates appear to be forthcoming.

11518 APTIC NO. 29035

Nash, T.

AN EFFICIENT ABSORBING REAGENT FOR NITROGEN DIOXIDE. *Atmos. Environ., 4(6):661-665, Nov. 1970. 11 refs.*

The addition of guaiacol (2-methoxy phenol) to alkali greatly improves its ability to absorb nitrogen dioxide, with the result that any simple bubbler can be used for taking large air samples for pollution measurements. In Arnold tubes at a flow rate of 0.6 reciprocal min, 0.1 N alkali has a collection efficiency of only 14%. In the presence of 0.004 M guaiacol, collection efficiency increases to 99%. A modified Saltzman reagent is used to estimate the absorbed gas, each mole of which is converted to 0.73 mole of stable nitrite ion. Interference from common pollutants is either negligible or preventable. (Author abstract modified)

11519 APTIC NO. 29041

Fergusson, Gordon J.

METHOD AND ANALYZER FOR HYDROGEN CARBON MONOXIDE AND HYDROCARBONS IN EXHAUST GASES. *(Scientific Research Instruments Corp., Baltimore, Md.) U. S Pat. 3,549,327. 8p., Dec. 22, 1970. 7 refs. (Appl. Dec. [illegible], 1967, 25 claims).*

An inexpensive analyzer for carbon monoxide and hydrocarbons in the exhaust gases is described, which requires little time to effect the desired analysis and may be operated by individuals having limited or no experience with testing apparatus of this type. A sample of gas is passed through a first stage where the free hydrogen present is selectively oxidized in a catalytic oxidation tube without oxidizing any of the hydrocarbons or carbon monoxide present. Platinized asbestos is the preferred catalyst. The sample is then passed through a drying tube in which any water present is removed, and the dried gas is passed through a second oxidation tube in which the hydrocarbons and carbon monoxide are oxidized to water and carbon dioxide. A wide range of catalysts could be used in this tube, but platinized asbestos maintained at a temperature of about 300 C is preferred. The thermal conductivity change caused by the oxidization of the hydrocarbons and carbon monoxide is measured and a first signal proportional to it is produced. The water concentration is also measured and a signal produced which is indicative of the hydrocarbon concentration. A portion of this hydrocarbon signal is substracted from the first signal in order to generate an output indicative of the carbon monoxide content. Drawings showing the construction of the apparatus are provided, and the chemical steps involved in the analysis procedure are described.

11520 APTIC NO. 29060

Hayakawa, Morihiko and Hiroo Mizutani

STUDY OF THE EFFECT OF OBSTACLE GAS ON THE ESTIMATION OF SULFUR OXIDE IN THE AIR BY LEAD DIOXIDE METHOD. (THE FIRST REPORT). *(Nisankanamariho ni yoru taikichu iosankabtsu sokutei ni okeru bogai gasu no eikyo ni tsuite. (Dai 1 po)). Text in Japanese. Nagoya-shi Eisei Kenkyushoho (Ann. Rept. Nagoya City Health Res. Inst.), no. 16:119-120, 1969. 4 refs.*

The presence of nitrogen dioxide and hydrogen sulfide effects the measurement, by the lead dioxide method, of sulfur dioxide in the air. After exposing PbO2 samples previously treated with H2S and NO2 to air for one month on the roof of the Nagoya City Health Research Institute, the estimations of sulfur dioxide for for treated and non-treated samples were compared. After the PbO2 samples were placed in the reaction vessel, pressure was reduced to 30 cm of the inside diameter of the disiccator. Hydrogen sulfide and NO2 were added and left to react for 24 hours. When both treated and non-treated samples were tested under these conditions, a 10% or less error was found. Increasing NO2 content reduced the volume of lead sulfate. The relation Y equals 100-17.5 log X (where Y is the ratio of intake of SO2 and X is the volume of lead nitrate) was found and its rate was 20 mg Pb (NO3) 2/100 sq cm PbO2; this was a decrease of about 18%. Hydrogen sulfide reacted with PbO2 to produce PbS, which gave the plus errors on the estimated values.

11521 APTIC NO. 29061

Matula, Richard A.

INSTRUMENTATION FOR SHOCK TUBE RESEARCH. *Res. Dev., 22(1): 20-28, Jan. 1971. 29 refs.*

The shock tube is a practical system to predict the behavior of various chemical and physical processes in high temperature (1000-6000 K) gaseous media. The conventional shock tube is a device in which a one-dimensional shock wave is generated by rapidly bursting a diaphragm that separates a high-pressure, low molecular weight driver gas from a lower pressure, test gas. Rare gases are often used as the test gas and low molecular weight gas such as helium or hydrogen is often used as a driver gas. The shock tube consists of four components: a high pressure driver section, a low pressure test (or driven) section, a diaphragm separating these two sections, and a gas handling system. Fundamental meaaurements are shock wave speed and the subsequent evaluation of shock Mach number. All experimental methods utilized to determine shock speed involve the measurement of the motion of the shock front relative to the tube, and can be divided into two classes, based on whether the average speed over a given distance is measured or whether the shock speed is measured continuously. The determination of transient pressures behind shock waves is based on the measurment of a pressure-dependent electrical property. The pressure transducer must have extremely high time response (rise time near 1 microsecond), low frequency, high sensitivity, and good resolution. Although temperature is the most useful property associated with a shock heated gas, unfortunately it is one of the most difficult to measure directly. The most successful measurements have been obtained by optical or acoustical techniques. Most widely used is the spectral line reversal technique. Also, Carnevale and co-workers have measured temperature by determining the speed of sound. The optical refractive index of the gas can be utilized to determine the gas density. A variety of shock tube studies have yielded information concerning relaxation phenomena, transport properties, spectroscopy, and chemical kinetics.

11522 APTIC NO. 29063

Cross, Frank L., Jr. and Frederick B. Higgins, Jr.

UNDERSTANDING SOURCE TESTING. *Pollution Eng., 2(5):35-38, Nov.- Dec. 1970.*

Source testing is used to determine process losses as represented by atmospheric emissions, compliance with air pollution control regulations, and in design of air pollution control equipment. Components of basic trains for source sampling are noted together with ways of expressing test results and the importance of isokinetic sampling in source testing. Normally, results of a meaningful source test are expressed in terms of both concentration and weight, but information for the design of equipment must also include particle size, moisture content, gas flow, stack temperature, and operational variables. Isokinetic sampling is necessary to obtain representative results when collecting particle larger than five micron in diameter of the three basic approaches to maintaining idokinetic sampling rates, the most accurate is to measure all variables continuously and calculate the sampling rate at frequent intervals. Manpower requirements for two particulate tests on a single exhaust stack are summarized.

11523 APTIC NO. 29072

Pilat, Michael, J., David S. Ensor, and John C. Bosch

SOURCE TEST CASCADE IMPACTOR. *Atmos. Environ., 4(6):671-679, Nov. 1970. 24 refs.*

A description is given of a source test cascade impactor for measuring the size distribution of particles in stacks and ducts at air pollutant emission sources. The impactor is operated inside the stack or duct to achieve true isokinetic sampling with a minimum of wall losses and condensation problems. The impactor includes seven stages (a single inlet jet stage, six multijet stages) followed by a filter. The single jet of the inlet nozzle (first stage) eliminates the problem of particle loss on the top of the first multi-jet stage. One eighth in. high rims around the parameter of the plates prevent particles from falling to the wall. The source test impactor has been used to measure the size distribution of particles emitted by a coal-fired power boiler, a kraft pulp mill recovery furnace, and a plywood veneer drier. Particle size distributions measured at the power plant and kraft recovery furnace are presented.

11524 APTIC NO. 29078

Soole, B. W.

CONCERNING THE CALIBARATION CONSTANTS OF CASCADE IMPACTORS, WITH SPECIAL REFERENCE TO THE CASELLA MK. 2. *J. Aerosol Sci., 2(1):1-4, Feb. 1971. 14 refs.*

Three kinds of calibration diameter for each of the several stages of a cascade impactor are described which, in appropriate association with the masses of deposited material, enable cumulative mass distributions to be drawn: namely, the effective cut-off size, the mass median diameter, and the effective drop size. For an ideal impactor in which separation of particles of different sizes is complete, each of these will give correct cumulative curves for any sampled distribution. For real impactors, however, cumulative curves drawn against effective cut off sizes and mass median diameters will, in general, be subject to errors, but effective drop sizes and 'effective mass median diameters' may be calculated for log-normal distributions which will give curves without error. Values of the four calibration diameters are calculated for the Casella Mk 2 impactor for several of such standard distributions. It is shown that a method of successive approximation, for which the effective drop sizes are the most suitable, is theoretically necessary to determine the characteristics of an unknown log-normal distribution. (Author abstract modified)

11525 APTIC NO. 29091

Kaiser, R.

ULTRA TRACE ANALYSIS OF VOLATILE SUBSTANCES WITH GC METHODS IN THE SUB PPM AND PPB RANGE DOWN TO 10 TO THE MINUS 10TH POWER%. *J. Chromatographic Sci., 9(4):227-235, April 1971. 19 refs. (Presented at the Symposium on Advances in Chromatography, 6th International, Miami Beach, Fla., June 2-5, 1970.)*

A trace analysis is particularly prone to errors. Its systematic error often exceeds the random error by several orders of magnitude. Fundamentals and methods for recognizing the systematic errors are pointed out. These serve to derive principles for analytical procedures which show minimum susceptibility to systematic errors. As an example for such a procedure, reversion gas chromatography (GC), which does not entail any sampling and dosing errors and which does not require calibration of the measured values at trace concentrations, is presented. This technique uses one temperature field for enrichment in separated positions, one for closing the enrichment column for compounds with low retention, and one for focusing the concentration of separated compounds and elution. With this method, vapors in gases, liquids, and solids can be investigated. The procedure works fully automatically for the analysis of hydrocarbons in air in concentrations from 5 times 0.001 to 0.5 ppm. However, reversion GC methods do not provide a high separation efficiency. On-column enrichmet with dosage over several min at subambient low temperatures (less than -60 C) leads to the low temperature programmed GC technique. This makes possible the analysis of as little as 0.01 ppb of volatile organic traces in solids and liquids. However, this procedure is difficult to calibrate. Application examples are given. (Author abstract modified)

11526 APTIC NO. 29100

Low, M. J. D.

FOURIER TRANSFORM SPECTROSCOPY. *Naturwissenschaften (Berlin), 57(6):280-287, June 1970. 12 refs.*

Operating principles and advantages of Fourier Transform Spectroscopy are outlined. The computer-controlled Fourier Transform spectrometer was high speed and sensitivity and, because its performance is always optimized, does not require a highly skilled operator. Being a digital system, the data are in suitable form for all types of manipulations by large digital computers for data correlation or storage, and retrieval purposes. Individually or together, these factors are important for both science and technology in terms of what spectra can be measured and how easily and quickly, or in simple economic terms of cost per spectrum. A Fourier Transform spectrometer that operates in both the normal infrared and far infrared regions is schematically illustrated. Also shown are spectra, some ratioed and scale-expanded, of furfyl alcohol, ethyl octanote eugenol, and nitric oxide obtained with the instrument. (Author conclusions modified)

11527 APTIC NO. 29128

Rimberg, D. and J. W. Thomas

RESPONSE OF AN OPTICAL COUNTER TO MONODISPERSE AEROSOLS. *Atmos. Environ., 4(6):681-688, 1970. 13 refs.*

The response of the Royco 220 aerosol particle counter to monodisperse polystyrene latex spheres 0.500, 0.557, 0.81, and 1.099 micrometer in diameter and 1.947 micrometer diameter polyvinyltoluene was measured to determine the instrument's ability to classify particles according to size and to determine the number of particles per unit volume of air. Also, the instrument was tested for linearity of response to changes in the number of particles per unit volume. The results indicate that the instrument detects the same size particles on several different channels, that particle number concentrations for aerosols 0.81 micrometer and larger compare favorably with microscope counts, and that the instrument is linear. Experiments with a gravity settler indicated that the latex aerosols from 0.5-1.099 micrometer were actually rather monodisperse, despite an apparent heterodispersity shown by the optical counter. The 1.947 micrometer aerosol showed heterodispersity by both the optical counter and settler methods. This was due to the high concentration of atomized emulsifier which could be removed by centrifugation to produce a monodisperse aerosol. (Author abstract modified)

11528 APTIC NO. 29133

Steinke, Irmhild

CONTRIBUTION TO THE DETERMINATION OF TRACES OF ALIEN SUBSTANCES (LEAD) IN LIGHT GASOLINE. *(Beitrag zur Bestimmung von Fremdstoffspuren (Beli) in Leichtbenzin). Text in German. Gas Wasserfach (Munich), 112(4):189-191, 1971.*

While the dithizone method is suitable for determining very small quantities of lead in gasoline, dithizone is not specific for lead. With many other heavy metals, it forms colored dithizonates. The measures necessary to eliminate these metals make the method rather time-consuming. Interferences can be avoided by measuring the atomic absorption of lead, an analytical method that is to be preferred over all dithizone methods. Atomic absorption requires not more than about one hr, while the dithiozone method requires about three hrs. For atomic absorption, the lead must be converted to the aqueous phase which is evaporated to 5 ml. This method permits lead concentration above 10 ppb to be determined with a standard deviation of plus or minus 5 ppb. The method was used to determine the presence of lead at the points where gasoline passes through a cracking plant. Of the 20 ppb lead in the gasoline before it entered the plant, 290 remained in the plant. About 20 g lead were found in the gasoline evaporator, 5 g on the hydration contact, and 200 g on the Nimox contact. Eighty % of the lead brought into the plant was found.

11529 APTIC NO. 29146

Fratucello, Giovanni and Giorgio Giovanelli

AUTOMATIC COUNTING AND SIZING OF AIRBORNE FERROMAGNETIC PARTICLES. *Rev. Sci. Instr., 42(5):663-666, May 1971. 6 refs.*

A continuous detector is described that counts and sizes individual airborne ferromagnetic particles while simultaneously measuring their magnetic moment. The detector measures magnetic flux variations caused by ferromagnetic particles crossing a search coil; the size of the particles is derived from pulse height analysis. Although the instrument s detection threshold is presently 10 micron for iron particles, it is believed that technical improvements will extend the sensitivity down to 1 micron The size of the detector is such that it could be mounted in balloon packages. (Author abstract modified)

11530 APTIC NO. 29155

NEW DIESEL SMOKE OPACITY METER. *Diesel Gas Turbine Progr., 36(7):21, July 1970.*

The portable smokemeter is described which accurately determines, in two minutes or less, opacity levels of diesel engine exhaust on vehicles in the shop, on a chassis dynamometer, or on the highway. The smokemeter measures relative light absorption of the smoke plume discharged from a diesel engine. This is accomplished by passing light pulse through the plume and detecting remaining energy with a photoelectric detector. The instrument consists of two basic assemblies--a sensor unit and a measuring unit. The sensor contains light-emitting and optical sensing diodies supported by a yoke assembly. The hand-held measuring assembly includes operating controls; opacity meter; solid-state, electronic circuitry, and a self-contained rechargeable power unit. On the basis of extensive field tests, the instrument was selected as the official smokemeter for the state of New Jersey.

11531 APTIC NO. 29157

Schulze, Volker

GAS CHROMATOGRAPHIC OPERATING AND PRODUCT CONTROL IN A COKING PLANT. *(Gaschromatographische Betriebs- und Produktenkontrolle in einer Kokerei). Text in German. Gas Wasserfach (Munich), 112(4):179-182, 1971.*

Gas chromatography is used in coking plants for analysis of hydrocarbon gases. This method has the advantage that a clear distinction can be made between benzene and benzene hydrocarbons. Initially, gas chromatography was used to study connections between the composition of new types of gases and soot depositions. Small concentrations of carbon monoxide in the presence of considerable nitrogen are not accurately separated by gas chromatography unless duration of analysis is more than 20 min. For operating control, gas chromatography is indispensable. Direct naphthalene determination by gas chromatography without enrichment has not yet been carried out satisfactorily.

11532 APTIC NO. 29185

Magyar, Martha, John L. Bove, Benjamin Nathanson, Stanley Siebenberg, and Edward F. Ferrand

ANALYSIS OF BARIUM SULFATE BY ATOMIC ABSORPTION. *Environ. Sci. Technol., 5(4):358-359, April 1971. 5 refs.*

A simple method is described for analyzing total barium in high-volume samples by atomic absorption spectrometry. The reducing potential of filter paper on barium sulfate is utilized to reduce quantitatively the insoluble barium compound to acid soluble barium sulfide. Recovery rates are tabulated for application of the method to barium chloride solutions, solid barium, and air collected at a disel bus fuel stop. Analytical results for the bus stop air samples agreed well with those obtained by emission spectrography. (Author abstract modified)

11533 APTIC NO. 29189

Matushita, H. and Y. Esumi

DIRECT FLUOROMETRY OF BENZO(A)PYRENE AND RELATED HYDROCARBONS ON THIN-LAYER CHROMATOGRAM AND ITS APPLICATION TO AIR POLLUTION STUDIES. *(Hakusojo takanhokozoku tankasuiso no chokusetsu keiko bunseki to sono taiki osen bunseki eno tekiyo). Text in Japanese. Taiki Osen Kenkyu (J. Japan Soc. Air Pollution), 5(1):76, 1970. (Proceedings of the Japan Society of Air Pollution, Annual Meeting, 11th, 1970.)*

A simplified method of analyzing benzo(a)pyrene in air by thin-layer fluorescence spectroscopy is described. The analysis consists of the following steps: collection of atmospheric dusts; extraction by sublimation in vacuo; separation by two layer one-dimensional thin-layer chromatography; and determination by thin-layer fluorescence spectroscopy. Application of the method resulted in the determination of benzo(a)pyrene benzo(a)anthracene, benzo(b)fluorescein, benzo(k)fluorescein, pyrene, perylene, and benzo(ghi)perylene in suspended particulates. Also, it was discovered that calibration curves obtained from standard samples on the same thin layer gave good results. In addition, the thin-layer fluorescence spectroscopy has the advantage of high sensitivity and negligible variations in the base line due to nonuniformity of the thin layer.

11534 APTIC NO. 29190

Kanamori, Shozo

MEASUREMENT OF ATMOSPHERIC AMMONIA (2ND REPORT). *(Taikichu anmonia nodo no sokutei. Dai-2-ho). Text in Japanese. Taiki Osen Kenkyu (J. Japan Soc. Air Pollution), 5(1):84, 1970. (Proceedings of the Japan Society of Air Pollution, Annual Meeting, 11th, 1970.)*

Glass-fiber filters treated with sulfuric acid were used to collect ammonia in air. When ammonia gas mixed with previously purified air was passed through a filter treated with 1/50 N H2SO4 for about one hr, the collection rate was less than 50%. Subsequently, 5N was the optimal concentration. Results of analysis by pyridine-pyrazolone and Nessler methods of the ammonia collected by 5 N H2SO4 are tabulated. As the case of collection by impingers, the results show the effect of aldehydes.

11535 APTIC NO. 29198

Serper, Allen

A LOOK AT THE METHODS FOR MEASURING AIR POLLUTANTS. *Eng. Mining J., 172(4):124-128, April 1971.*

The two types of measurement usually needed for airborne pollutants are source testing and air quality. Gases commonly measured by colorimetric methods include ozone, sulfur dioxide, nitrogen dioxide, and hydrogen fluoride. The principle of colorimetry is based on the measurement of the iodine released from the reaction of a particular oxidant with potassium iodide in a neutral, buffered solution. Improvements in sensitivity of coulometric titration cells have led to the development of several commercial coulometric systems for continuous SO2 monitoring. The improved version of the coulometric cell is designed to respond to bromine oxidizable or titratable sulfur compounds that occur in very low concentrations. The iodometric system is based on the generation or liberation of iodine by ozone, and the consumption of iodine by sulfur dioxide in an iodide solution. New pollution monitors for the detection of SO2, nitric oxide, and NO2, may utilize sealed electrochemical sensors, thus requiring no handling of chemicals. With infrared analyzers, the percent of radiation absorbed is proportional to the concentration of the component of interest in the sample. Operation of an electroconductivity analyzer is based upon the principle that a noxious gas will ionize in pure water, thus decreasing the electrical resistance of the water. The basic principle of ionization analysis is the ionizatio of hydrocarbons in a hydrogen flame. Stack sampling, isokinetic sampling for particulates, and continuous monitoring systems are also reviewed.

11536 APTIC NO. 29201

Low, M. J. D. and H. Mark

DERIVATIVE TRACES IN INFRARED FOURIER TRANSFORM SPECTROSCOPY. *Appl. Spectry., 24(1):129-130, Jan.-Feb. 1970. 23 refs.*

Infrared multiple-scanning Fourier transform spectrometers which incorporate a computer core memory and analog data conversion system are described. A simple differentiator circuit was installed between the wave analyzer and the X-Y plotter of a modular Fourier transform spectrometer system. The system incorporated a Block model 302 coadder and a 2 by 1024 channel time-averaging computer. The interferogram stored by the latter could be used to produce and reproduce the corresponding spectrum, or the first or second derivative traces, as many times as was required. A Block model 331 wave analyzer was used. The read-out time for a trace could be varied from 45 sec to 6 min.

11537 APTIC NO. 29202

Rubiner, I. A., M. Yu. Sultanov, and M. Z. Belen kii

CATALYST FOR GAS ANALYZER FOR CARBON MONOXIDE (EXCHANGE OF EXPERIENCE). *Ind. Lab. (USSR) (English translation from Russian of: Zavodsk. Lab.), 36(10):1525, Oct. 1970. 3 refs.*

Continuous, portable, or stationary gas analyzers are used to determine the amount of carbon monoxide in the atmosphere. Because the usual catalyst, hopcalite, is susceptible to irreversible moisture poisoning and because its activity changes with time, a ne catalyst based on copper and cerium oxides was synthesized. It has a composition of 2 CuO.CeO2 and has a high activity. This catalyst fully oxidizes CO at the working temperature of a thermochemical analyzer (100 C), and its activity does not change with time. The catalyst s activity with respect to CO oxidation was determined at different volume speeds. The CO concentration varied from 0.002 to 5 vol%. The lower limit of this range corresponds to the sanitary specifications. The presence of up to 2 vol% of water vapor slightly reduces the catalyst s activity, so that the temperature must be raised. The lowering of the activity is reversible. The complete oxidation of CO at 100 C can be obtained by adjusting the gas speed according to the catalyst s activity.

11538 APTIC NO. 29218

Bratzel, M. P., Jr., R. M. Dagnall, and J. D. Winefordner

A HOT WIRE LOOP ATOMIZER FOR ATOMIC FLUORESCENCE SPECTROMETRY. *Appl. Spectry., 24(5):518-521, Sept.-Oct. 1970. 12 refs.*

Samples containing silver, beryllium, bismuth, cadmium, copper, gallium, mercury, magnesium, lead, thallium, and zinc were vaporized from a tungsten or platinum loop into an argon stream and excited by radiation from discharge tubes without electrodes to produce atomic fluorescene. The integrated atomic fluorescence signals are independent of loop material and loop temperature, and nearly independent of anion type, sample nature, and argon flow rate. The device may have use for fundamental studies for measurement of quantum yields as well as fo applied studies of measuring nanogram to picogram quantities of volatile metals in small amounts of sample. The loop and sheathing device are described. (Author abstract modified)

11539 APTIC NO. 29220

Kusumoto, Masako and Toshio Toyama

THE MICRO ANALYSIS OF FLUORINE BY THE LINEAR WASH-OUT TYPE OVEN AND ITS APPLICATION. *(Senjo chushutsugata obun niyoru fusso no biryo sokutei to sono oyo). Text in Japanese. Sangyo Igaku (Jap. J. Ind. Health), 13(2):120-127, March 1971. 30 refs.*

A linear wash-out oven was developed from microanalyses of fluorides. The procedures used are similar to the ring-oven technique but with higher sensitivity in detection and with more convenient operations. Organic substances were ashed in an oxygen combustion flask, and the fluoride was detected with aluminum chromzrol S complex following recovery from interfering substances by the diffusion method. From 0.08 to 4 times 100,000 ppm were successfully quantitated with 90% recovery; the standard deviation relative to the expected amount of four repetitive measurements was less than 30%. The method was applied to fluoride determination in rice crops harvested within 10 km of an aluminum refinery. The highest concentation was found in bran powder (122 ppm). Full grains contained up to 32 ppm, while cleared grains averaged 2.91 ppm. Fluoride concentrations decreased with distance from the refinery. Fluoride in cleared grain can easily be dissolved in water, then vaporized and removed from the grain on cooking. The average fluoride intake would be 240 micrograms if the daily consumption of polluted rice totaled 1500 g. Yet this amount does not exceed the average intake of approximately 180-240 micrograms among normal adults in rural districts of Japan, the total intake daily being estimated as approximately 1.6-2.1 micrograms.

11540 APTIC NO. 29226

Hwang, J. Y.

LEAD ANALYSIS IN AIR PARTICULATES SAMPLES BY ATOMIC ABSORPTION SPECTROMETRY. *Can. Spectr., 16(2):43-45, March 1971. 10 refs. (Presented at the Spectroscopy Symposium of Canada, 16th, Montreal, Quebec, Oct. 1969.)*

Atmospheric particulate samples were collected on organic membranes for the analysis of lead by atomic absorption spectrometry. In order to maximize the sensitivity and to improve the accuracy of the analysis, various parameters were investigated: flame conditions, flame profiles, and chemical interferences in air acetylene and argon-entrained air-hydrogen flames. Because of severe chemical interferences from the matrices, argon-entrained air-hydrogen flame was useless in the analysis of lead in air particulate samples in spite of slight improvement of the detection limit of lead in this flame environment compared to air-acetylene flame. In air-acetylene flame, no serious cationic interferences were found, but anionic interferences of sulfate and silicate were significant in the lead analysis. (Author abstract modified)

11541 APTIC NO. 29243

Prochazka, Vladimir and Jaromir Base

METHODS FOR EVALUATING THE RESULTS OF MEASURING THE INTENSITY OF THE ODOR OF

HEATING GASES. (Vyhodnocovani mereni intenzity zapachu topnych plynu). Text in Czech. Plyn (Prague), 51(3): 70-72, 1971. 6 refs.

Attempts were made to provide an objective method of determining the intensity of odors by measuring the content of odorants, such as sulfur compounds in the air. However, this was found to be unreliable since there are cases where the simultaneous presence of certain substances which individually would cause an odor, results in an interference and a reduction in the intensity of the odor. A synergism of odors can also occur. For instance, organic sulfides have a milder odor than mercaptans, but if the two are mixed they produce an intensity of odor which is greater than the average odor intensity of the two components. As a result of these observations it was concluded that even the most perfect analytical control of the deodorant content in a gas cannot replace or eliminate the control by smell. For the intensity of odors registered by smell, a classification was adopted in which class 0.5 signifies a condition where the presence of an odor is just noticeable, class one means a weak smell, class two a warning smell, and class three a very strong smell. The sensitivity of the human olfactory organ varies among individual persons, therefore, the average classifications obtained from a number of persons related with the odorant content established by gas analysis. Class two can in some cases be equated with a condition which signifies a danger of poisonous effects or of explosiveness.

11542 APTIC NO. 29246

Kanekawa, Akira

THEORETICAL CONSIDERATION IN THE MEASUREMENT OF SMOKE PARTICLES BY OWL (I)-MEASURABLE DIAMETER OF PARTICLES AND ITS DEPENDENCE ON REFRACTIVE INDEX.

(Owl ni yoru enmutai ryukei sokutei no rironteki kosatsu (1)-sokutei genkai ryukei to kussetsuritsu izonsei). Text in Japanese. Preprint, Japan Society of Chemical Engineering, Tokyo, p. 357-368, 1970. 3 refs. (Presented at the Japan Society of Chemical Engineering, Autumn Conference, 4th, Hiroshima, Japan, Oct. 6-8, 1970, Paper F115.)

The owl is a device for the determination of the average diameter of spherical particles by the change of color of rays diffracted by them. It is widely used because of its easy operation and low cost. The red band is observed with an eye through a telescope for easy determination. The average diameter is usually known by measuring the number of red band appearing in the range of observed angle or by the measurement of the first strongly detected angle. The change in color of the diffracted ray with the observed angle strongly appears where the diameter of the particle agrees with the wavelength of light: the relation between the diameter and measured value of the owl is theoretically based on Mie diffraction theory. The identification of the red band is strictly by the three points method, and approximately by ratio of ray strength to the complementary color (green). Identification of the red band is by the ratio of lights: red (0.629 micron) and green (0.524 micron). The diffraction angle distribution of the spectrum intensity (red/green) on a parameter of refractive power 1.60 was investigated regarding perpendicular and parallel components with the sum of them. The experimental results showed that the perpendicular component gave the most obvious change of the ratio, and reproducibility for particle diameter. The change of the ratio with the diffraction angle is shown as the dependence on particle diameter at a refractive index of 1.40 and 1.80, and as the dependence on the refractive index at a particle diameter of 0.6 and 1.0 micron. The observed number of red bands had a good relation to the particle diameter except in the case of diameters greater than 1.5 micron. The refractive inde greatly affects the results and no relation was obtained for the first maximum ratio and the particle diameter.

11543 APTIC NO. 29259

Fleming, Ralph D.

EFFECT OF FUEL COMPOSITION ON EXHAUST EMISSIONS FROM A SPARK-IGNITION ENGINE.

Bureau Mines Washington, D. C., Rept. Investigations, 7423, 68p., Sept. 1970. 39 refs. NTIS: PB 194 942

A single-cylinder research engine was operated on pure hydrocarbons and simple (two-component) mixtures of pure hydrocarbons to study the effect of fuel composition on exhaust emissions from a spark-ignition engine. Used as fuels were three pure hydrocarbons that represented the primary hydrocarbon types present in commercia motor fuels: A paraffin (2,2,4-trimethylpentane), an olefin (2,4,4-trimethylpentene-2), and an aromatic (metaxylene). The engine was operated at the same equivalence ratio for all of the fuels used in the experiment. Exhaust gas samples were collected and quantitatively analyzed for carbon monoxide, carbon dioxide, hydrogen, nitrogen oxides, aldehydes, and hydrocarbons. Exhasust hydrocarbons were separated and quantitatively measured with a chromatographic system employing a flame-ionization detector. Unknown hydrocarbons and oxygenated materials in the exhaust were identified with a Time-of-Flight mass spectrometer coupled to a chromatographic system. The results of the exhaust gas analyses showed that ethylbenzene, 1-methyl-3-ethylbenzene, and 1-methyl-3-vinylbenzene were more abundant in the exhausts from either 2,2,4-trimethylpentane--m-xylene or 2,4,4-trimethylpentene-2--m-xylene fuel mixtures than in exhaust produced from m-xylene. Also, the pure 2,4,4-trimethylpentene-2 fuel produced smaller amounts of C2 to C7 olefins in the exhaust than that produced by the pure 2,2,4-trimethylpentane fuel. The exhaust from pure m-xylene fuel contained aromatic hydrocarbons of higher molecular weight than the parent fuel. The amount of total hydrocarbon (moles of exhaust hydrocarbon per mole of fuel used) in the exhaust from the three pure fuels decreased in the following order: 2,2,4-trimethylpentane greater than 2,4,4-trimethylpentene- greater than m-xylene. The hydrocarbon mole-fractions of unreacted fuel in the exhausts produced from each of the pure fuels were 0.20 for 2,2,4-trimethylpentane, 0.13 for 2,4,4-trimethylpentene-2, and 0.66 for m-xylene.

11544 APTIC NO. 29260

Aurand, K., E. Lahmann, and H. Ruhle

COMPARATIVE INVESTIGATIONS WITH A CONTINUOUSLY-WORKING DUST MONITOR.

(Kontinuierlich arbeitenden Staubmonitor). Gesundh. Ingr., 89(12):360-363, 1968. 5 refs. Translated from German. Belov and Associates, Denver, Colo., 10p., Dec. 23, 1970.

A dust monitor FH 62 was developed for the continuous determination of air pollution in the form of dust. A comparison of the dust monitor with the discontinuous gravimetric method produced high correlations. Working according to the principle of B-radiation absorption, the monitor has an advantage over the gravimetric method because it requires less maintenance and conducts automatic, continuous dust concentration determinations. Because the accuracy of measurement depends on the constancy of the air-throughput, several factors can cause error, including the filter strip coating, the air suction tube length, and the air humidity. The dust monitor was installed in a thinlynsettled suburb of Berlin (Berlin-Dahlem). During the continuous monitoring, maximum three-hour values of about 0.3 mg dust/cu m were obtained.

11545 APTIC NO. 29262

Dubois, E., P. Magot-Cuvru, J. Y. Deysson, F. Billard, and G. Madelaine

EXPERIMENTAL STUDY OF AN ANNULAR IMPACTOR. *(Etude experimentale d un impacteur annulaire). Text in French. International Atomic Energy Agency, Vienna (Austria), Proc. Symp. Instruments and Techniques for the Assessment of Airborne Radioactivity in Nuclear Operations, Vienna, Austria, 1967, p. 351-377. 2 refs. (July 3-7.)*

It is desirable to calibrate impactors in order to gain quantitative information from the measurements made with them. Calibration of an impactor requires high reproduceability of the experimental conditions. In particular, the nature of the surface on which the deposit of particles is formed must be such that each impact is effective. The best results are obtained by coating the plates with an adhesive mixture of dioctylphthalate and Canada balsam. With this procedure, the shape of the curves for yield of stages is similar to that of theoretical curves. The geometry of the impactor studied was such that certain dimensional relationships remain unchanged from one stage to the next. Furthermore, the curves for each stage can be reduced to a single curve by adopting a system of reduced co-ordinates. From this curve the different stages can easily be proportioned so as to localize at the desired point of the spectrum the cut-offs made by each stage. The same curve also indicates the effect of the rate at which air passes through the instrument on the stopping power of each stage. Throughput of 24 liters/min was selected: fo four stages it corresponds to a pressure drop of approximately 200 mm/Hg. The first and last cut-offs are at 0.5 and 4 micron respectively. Depending on the use of the sample and the number of fractions desired, one or two intermediate stages can be eliminated. (Author abstract modified)

11546 APTIC NO. 29269

Laffort, Paul

BIVALENT RELATIONSHIP BETWEEN THE OLFACTORY THRESHOLDS OF 50 PURE SUBSTANCES AND SOME OF THEIR MOLECULAR PROPERTIES. *(Relation biunivoque entre les seuils olfactifs de cinquante corps purs et certaines de leurs proprietes moleculaires). Text in French. Compt. Rend. Soc. Biol. (Paris), 162(2):1704-1712, July-Dec. 1968. 12 refs.*

A mathematical formula is derived from a study of 50 substances, mostly organic, which permits the calculation of the olfactory threshold in man from certain physicochemical data. The important parameters in the equation are the apolarity (A) derived from the molecular volume, the hydrogen bond index (H), and the volumetric polarizability of the octet. The group of 50 substances examined includes aliphatic hydrocarbons, common alcohols, some esters of ethyl alchol, common organic acids, ammonia, bromine, carbon disulfide, and hydrogen sulfide.

11547 APTIC NO. 29294

Binek, B. and B. Dohnalova

A NEW AEROSOL PARTICLE ANALYSER. *Collection Czech. Chem. Commun. (Prague), 36(2):954-956, Feb. 1971. 11 refs.*

A new method for analyzing aerosol particles, called spectral scintillation analysis, was developed. Further development led to the design of a Scintillating Particle Counter to rapidly determine numerical and weight concentration, distribution of particles according to size, chemical composition, and degree of electric charge. A combination of scintillation analysis and light scattering gave a wide scope of application. The correct and accurate functioning of the instrument depends on reliable and easy calibration. Calibration is performed with monodisperse aerosols generated by a vibrational generator.

11548 APTIC NO. 29297

Groffman, D. M. and R. Wood

REVISION OF A FIELD METHOD FOR THE DETERMINATION OF TOTAL AIRBORNE LEAD. *Analyst, 96(1139):140-145, Feb. 1971. 6 refs.*

An improved field method is described for determining airborne lead at concentrations up to 0.8 mg/cu m. After collection on a membrane filter, the lead is dissolved in nitric acid-hydrogen peroxide solution and complexed with dithizone. The lead dithizonate is extracted into 1,1,1-trichloroethane and the color intensity of the complex is compared visually with standards. The apparatus used is simple to operate and the time required for a complete determiniation is about 15 min. Although designed specifically as a field test, the method can be used to determine lead accurately if a spectrophotometer is employed. (Author abstract modified)

11549 APTIC NO. 29298

Meddle, D. W. and R. Wood

A FIELD METHOD FOR THE DETERMINATION OF IRON OXIDE FUME IN AIR. *Analyst, 96(1138):62-66, Jan. 1971. 9 refs.*

A field method is described for determining iron oxide fume in industrial atmospheres at concentrations up to 20 mg/cu m. After collection on filter paper, the iron oxide is dissolved in a hot solution of hydroxylammonium chloride in hydrochloric acid. The iron solution is quantitatively transferred to a calibrated flask and the red complex of iron(II)-bathophenanthrolinedisulfonate is formed, the intensity of which is determined either spectrophotometrically or by visual comparison with a set of permanent color standards. The procedure is simple to carry out an the time required for a complete analysis is about 25 min. With minor modifications, this method can be adapted to the field or laboratory determination of other ion-containing species, including metallic iron, in the form of fume or dust, or both. (Author abstract modified)

11550 APTIC NO. 29300

Sanche L. and G. J. Schulz

NEW RESONANCES IN THE TOTAL CROSS SECTION OF ELECTRONS ON CO AND O2. *Phys. Rev. Letters, 26(16):943-946, April 19, 1971. 23 refs.*

A transmission experiment was used to observe the structure in the total electron-impact cross section in carbon monoxide and oxygen. The structure in the cross sections was enhanced by measuring directly the derivative of the transmitted current. An isolated resonance in CO was observed at an electron energy of 10.04 plus or minus 0.03 eV. In oxygen, the observed structure correlated well with the absorption spectra in the energy range 8-10 eV. In addition, two very sharp resonances (30-meV width) were observed at 8.02 plus or minus 0.03 and at 8.25 plus or minus 0.03 eV. (Author abstract)

11551 APTIC NO. 29301

Lewis, D. T.

ENVIRONMENTAL RESEARCHES AT THE LABORATORY OF THE GOVERNMENT CHEMIST. *Lab. Pract. (London), 20(11):24-30, Jan. 1971. 31 refs.*

The Laboratory of the Government Chemist (Great Britain) is concerned with quality control of food, drugs, agriculture products waters, and industrial atmospheres. To this end the Laboratory carries out numerous analytical investigations relating to the quantitative determination of important additives and contaminants. These activities are described and illustrated by examples. Special attention is given to Laboratory studies of organochlorine pesticides in foodstuffs, detergent mixtures in sewage effluents, fluoridation of drinking water, contamination of water supplies with fission products, and the concentrations of radium and radon in drinking waters. Methods used to estimate atmospheric contaminants are tabulated together with threshold limit values of the contaminants.

11552 APTIC NO. 29307

Fenson, A., K. Dimmock, and G. M. S. Duff

RAPID METHODS FOR THE DETERMINATION OF LOW CONCENTRATIONS OF TOTAL SULPHUR IN LIQUIDS AND GASES. PART II. THE DETERMINATION OF TOTAL SULPHUR IN NATURAL GAS AND SYNTHESIS GASES. *Analyst, 96(1140): 194-200, March 1971. 10 refs. (Presented at the Joint Meeting of the Scottish and North East Sections, Atomic Spectroscopy and Radiochemical Methods Groups on Trace Analysis, Saint Andrews, Scotland, June 1970.)*

A rapid method developed for determining total sulfur in light petroleum distillate is applied to the determination of total sulfu in natural gas. The sulfur compounds present in the gas are adsorbed on a small amount of active carbon, which is then allowed to react with a suspension of Raney nickel in a water-propan-2-ol mixture. The sulfur is determined as sulfide. An alternative procedure for determining total sulfur in synthesis gases is also described. The sulfur compounds on adsorbed on active carbon and desorbed into a stream of hydrogen, which then passes through a furnace at 900 C. The resulting hydrogen sulfide is determined as a stain on paper impregnated with lead acetate. Methods involving the use of a carbon adsorption tube give results with a precision of plus or minus 0.5 mg/cu m of sulfur on samples of stenched natural gas. These methods are particularly useful in situations where application of the more sophisticated oxidation and flame-photometric detection methods is not justified. (Author abstract modified)

11553 APTIC NO. 29313

Archer, J. S.

ON-LINE ANALYSIS OF WET COMBUSTION GASES BY GAS CHROMATOGRAPHY. *J. Inst. Fuel (London), 43(349):56-58, Feb. 1970. 7 refs.*

A technique is presented for the on-line analysis by gas chromatography of a single sample of wet combustion gas containing the following: carbon dioxide, carbon monoxide, hydrogen water, oxygen, nitrogen, methane, ethylene, and ethane. This analysis is not usually attempted with a wet gas or with a single sample. A hot-wire detector is used to detect components, which are separated on a dual column system. The columns used are 4-m Poropak Q and 2-m Molecular Sieve 5A at a helium carrier gas flow rate of 0.688 cu cm/s. A switching valve is incorporated to divert the sample beneath the columns. This technique was successfully used to analyze combustion gases withdrawn isokinetically from a residual fuel oil-fired combustion system. (Author abstract modified)

11554 APTIC NO. 29314

Belyayev, S. P. and L. M. Levin

AN EXPERIMENTAL INVESTIGATION OF AEROSOL ASPIRATION. *Bull. Acad. Sci USSR, Phys. Atmos. Oceans (English translation from Russian of: Izv. Akad. Nauk SSSR, Fiz. Atmosfery i Okeana), 6(11): 683-691, 1970. 21 refs.*

A stream of aerosols near aspiration tubes was photographed to study the aspiration process in pulsed illumination. The aspiration coefficient (A sub var) which takes account of the variation of the concentration before it enters the sampler due solely to interactions between aerodynamic and inertial forces was found from the limiting paths of isodisperse particles entering the tubes. The dependence of A sub var on the aspiration rate, the Stokes number, and the tube wall thickness was studied. The results obtained differ considerably from those reported for other experiments; however, the results for very thin-walled tubes are in satisfactory agreement with a theoretical study. A sub var was found to be highly dependent on tube wall thickness, a factor neglected by most previous investigators. For thick-walled tubes A sub var is not equal to unity even for isokinetic aspiration conditions.

11555 APTIC NO. 29317

Crecelius, H. J. and W. Forwerg

THE INTERFERENCE OF OZONE WITH THE NITROGEN DIOXIDE DETERMINATION BY THE SALTZMAN METHOD. POSSIBILITIES FOR ELIMINATION. *(Der Stoereinfluss von Ozon auf die Stickstoffdioxidbestimmung nach Saltzman. Moeglichkeit zur Ausschaltung). Text in German. Atmos. Environ., 4(6):689-691, 1970. 5 refs.*

To determine the interfering effect of ozone on the photometric determination of nitrogen dioxide by the Saltzman method, air containing 0.37 ppm 03 and 0.12 ppm 03 respectively was passed through the washing bottle containing the measuring reagent. Ozone concentrations within ppm limits increased color intensity. A brown color appeared with an absorption maximum at 380 nm while the dye formed by the reaction of the reagent with NO2 reached an absorption maximum at 550 nm. Thus the effect of ozone at 550 nm is relatively small. The increase in extinction of both solutions was about the same. In central Europe, ozone concentrations exceeding 2 ppm are rare and therefore the effect of ozone on results obtained by the Saltzman method can be ignored. But, under circumstances of a higher ozone level, its interference with the NO2 determination can be eliminated by a cartridge filled with pieces of natural rubber.

11556 APTIC NO. 29334

Matsushita, Hidetsuru and Yoshio Esumi

RAPID ANALYSIS METHOD OF BENZO(A) PYRENE IN AIR POLLUTANTS. *(Taikiosenbutsu chu no bentsu(a)piren no jinsoku bunsekiho). Text in Japanese. Japan Industrial Medical Society, Proc. Japan Ind. Med. Soc. Meet., 44th, Tokyo, Japan, 1971, p. 148-149. (April 3-4.)*

A simple and rapid method of analysis for benzo(a)pyrene (BaP) in air pollutants is reported. Airborne dusts were collected on a glass fiber filter with a high volume air sampler. The collected sample together with the filter was put into the flask of a vacuum sublimation extraction device, exhausted to

0.01 mm Hg, and then put into an electric furnace heated to 200 deg. After 40 minutes, the polyaromatic hydrocarbons and high grade fatty hydrocarbons sublimated were extracted and taken from the cool part of the sublimation tube. The extract, dissolved in cyclohexane as a test solution, was put into an oxygen-free cell for the measurement of fluorescence. The excited light wavelength was 363.0 millimicrons and the fluorescent spectrum was at a peak of 403.5 millimicrons. The narrow base line method was used to control the interferring effects of fluorescent substances. The reason for excluding oxygen from the test solution was not only to increase the degree of fluorescence of BaP but also to control the inteferring effects of benz(k)fluoranthene, the spectrum of which is similar to that of B(a)P. This method permits analysis of 10 samples daily. From the results of 22 tests, the ratios of B(a)P extracted from airborne dust were quite stable: approximately 89%.

11557 APTIC NO. 29335

Hirao, Shigehiro, Kazuhiro Kuwata, Akiko Tomimasu, and Toshio Hasegawa

MEASUREMENT OF AROMATIC HYDROCARBONS IN DUST. *(Funjin chu no hokazoku tanka suiso no sokutei). Text in Japanese. Preprint, Japan Chemical Society, Tokyo, 1p., 1971. (Presented at the Japan Chemical Society, Annual Meeting, 24th, Tokyo, March 1971, Paper 3348.)*

In order to speed up the measurement of aromatic polynuclear substances contained in atmospheric dust examinations were made by mass analysis. It was found that the main aromatic polynuclear substances were pyrene fluorantene, 1,2-benzanthracene and chrysene; and 1,2, 3,4-benzpyrene + perylene. Benzene extracts were impregnated with quartz wool and dried at normal temperatures. The sample was inserted into a mass analyzer to obtain a mass spectrogram, and by reading the peak heights of the masses 228 and 252, these substances are quantitatively measured. Benzanthron is selected as the standard, and by taking the background and ionization efficiency into consideration, a 100 microgram/ml benzene solution was prepared. As the evaporation speed of these substances changed, the ionization temperature was fixed at 100 C, and the mass spectrum was read 60 seconds after the sample was introduced. After obtaining the peak heights ratio of m/e 230 and m/e 234 from the spectrum before benzantron is added, the background of m/e 230 against benzantron was corrected. The range is 0.5-30 micrograms/ml benzene, but a comparatively low concentration range had greater precision. Quantitative analysis was made of a benzene solution by extracting dust with a Soxhlet extractor; the solution was also quantitatively analyzed by gas chromatography. Comparison showed considerable correlation between the figure obtained by mass analysis and gas chromatography. It can be used as an indicator for the benzpyrene and chrysene groups.

11558 APTIC NO. 29337

Oka, Minoru

METHODS AND PROBLEMS OF MEASURING DIESEL EMISSIONS. *(Haikigasu seibun no sokutei to sono mondaiten). Text in Japanese. Jidosha Gijutsu (J. Soc. Automot. Engrs. Japan), 25(3):276-282, March 1971. 5 refs.*

Measurement methods of three types of diesel emissions - gaseous pollutants smoke, and odor methods are described. For the measurement of such gaseous pollutants as carbon monoxide, nitric oxide, and hydrocarbons methods include gas chromatography, PDS (phenol desulfonic acid method), the Saltzman method, non-dispersive infrared, non-dispersive ultraviolet, and flame-ionization anaysis, and gas-liquid chromatography. The most difficult emissions to measure is HC, in that a sampled diesel exhaust gas has to be cooled rapidly in order to avoid the HC from being oxidized with the excess oxygen present; it is also necessary to keep the sampled gas at a higher temperature to avoid condensation of HC. Gas liquid chromatography is designed for the HC measurement. Filter paper and transmission techniques to measure smoke are discussed. In the filter paper method, soot or carbon particulates in the exhaust smoke are filtered and the blackened filter paper is then compared visually with a smoke chart to determine the soot density. The transmission method involves a photoelectric device which measures the density according to the smokes light transmissivity. Measuring devices for odors are still in development stage. At present, odor is evaluated by the human sense of smell.

11559 APTIC NO. 29342

Rendina, J. F. and R. E. Grojean

A HIGH RESOLUTION ELECTRON IMPACT SPECTROMETER FOR CHEMICAL ANALYSIS OF GASES AND VAPORS. *Appl. Opt., 9(9):2148-2153, Sept. 1970. 9 refs.*

A commercial electron impact spectrometer was developed which operates at an excitation energy of 100 eV and is capable of energy resolution of the order of 10 mV. Instrumentation has improved, as has energy resolution. Because of the favorable signal-to-noise rations, high resolution spectra can be obtained at considerably lower concentrations than with other methods. The spectrometer was designed to exploit the sensitivity of electron energy loss spectra to specific species in complex gas or vapor mixtures. A schematic is shown and the electron source, monochromator section, gas sample cell, energy analyzer section, and detector are described. The spectrometer can scan from -0.20 eV energy loss to +30 eV. Useful data are obtained over an equivalent optical scan from 1600/cm to 240,000/cm. Spectra for hydrogen, nitrogen, and carbon monoxide are discussed. The right resolution improves the facility to identify elements and decreases the level at which traces of specific elements become detectable.

11560 APTIC NO. 29343

Shirasawa, Tadao

RESEARCHES ON ENVIRONMENTAL POLLUTION MEASUREMENT. *(Kogai keisokuho ni kansuru kenkyu). Text in Japanese. Kokuritsu Kenkyujo no Kenkyu Seika (Researches of Government Research Inst.), no. 1, p. 291, Dec. 1969. 9 refs.*

In the field of air pollution, the method of monitoring dust density and particle size distribution is being established and control measure studied. The continuous monitoring of sulfur dioxides is studied, together with the effects of accompanying substances. Other harmful gases specified by the law, such as fluorine, are also investigated. In the area of water pollution, minute metal contents in industrial and mining effluents are being studied. Above all, a rapid and high sensitivity quantitative analysis of cadmium and mercury is aimed at. The results already obtained in the fields mentioned above were used as a basis of establishing Japanese Industrial Standards on dust and SO2 measurements of combustion exhaust and also on the test method for plant effluents. The results are also utilized for the public nuisance countermeasure of factories. The Government Research Institute is cooperating with the local governments, municipalities, and private industries in the education of staffs dealing with public nuisances.

11561 APTIC NO. 29352

Einstein, Harry

SMOKE DENSITY MEASURING DEVICE INCLUDING MEANS TO PERIODICALLY BLOC A LIGHT FROM A PORTION OF THE FIELD OF VIEW. *(Assignee not given.) U. S. Pat. 3,554,655. 8p., Jan. 12 1971. 2 refs. (Appl. Jan 27, 1969, 18 claims).*

Heretofore, the density of smoke has been measured by viewing the smoke through glass, plastic, or screen filters of varying densities which required the use of optical lenses and/or prisms wherein accurate measurements of black smoke density below Ringelmann 2 have not been possible no known devices can give accurate measurements of the density of white smoke. A device is described wherein a rotating shutter, suitably a rotating segmented disc, is placed to obscure a portion of the viewing tube directed a the ambient air adjacent the smoke to be measured. The shutter is rapidly opened and closed across the portion of the viewing field to be observed. Both white and black smoke can be examined. The density of the smoke is measured by comparing the appearance of the smoke with the appearance of ambient air. Black smoke is observed against a light background such as the sky. The shuttered portion of the field is brought as close to the smoke as possible while still viewing the ambient; then the shuttered view is compared to the actual smoke to determine whether the smoke is darker than the shuttered ambient. If so the smoke density has a higher Ringelmann value than the reference shutter. When white smoke is viewed against a dark background, illuminating lights are placed in the device to compensate for the appearance of the smoke due to light reflection. Ringelmann densities of down to 0.25 (corresponding to 5% obscuration) may be measured.

11562 APTIC NO. 29359

Brief, Richard S. and Brief, Richard S. and Robert G. Confer

AIR QUALITY MONITORING: PROCEDURES, DATA ANALYSIS. PART II. *Heating, Piping, Air Conditioning, 43(5):103-110, May 1971. 13 refs. PART I. Ibid., 43(3):121-128, March 1971.*

A continuous air monitoring facility was built in Linden, N. J. known as the Esso Research Air Monitoring Station, or ERAMS. Smokeshade was measured by automatic readings of light transmittanc in terms of the coefficient of haze (COH) per 1000 lin ft and with an isokinetic sampling probe. High correlation was found for reflectance and COH. Suspended particulates were collected on a glass fiber filter. Dust fall was measured on the roof of the ERAMS building with an open top collector. Data for 1969 and 1970 were compared and various equations were used to evaluate it. A five-station network of high volume samplers was set up for the metropolitan New York region to determine the chemical composition of suspended particulates. Samples, on filter paper, were collecte every sixth day starting in September, 1969 and subjected to spectrochemical evaluation. Ambient nitrogen dioxide levels were colorimetrically measured by ERAMS and the National Air Pollution Control Administration (NAPCA). Ozone was also measured at ERAMS by an ozone meter operating on the principle of oxidation-reduction of buffered neutral potassium iodide solution. NAPCA, at a nearby site, made similar measurements with a colorimetric method which gave values approximately 15% higher than the ERAMS colometric method. Carbon monoxide values were also obtained by ERAMS and NAPCA with a Beckman nondispersive infrared analyzer. A Beckman hydrocarbon analyzer gave indications of both methane and total hydrocarbon concentrations, based on the principle of flame ionization detection. The King hydrocarbon detector is another method. The levels of contaminants usually decreased with increasing wind speed. Thus, different instruments designed to measure specific pollutants can give significantly different results

11563 APTIC NO. 29378

Davis, John W.

PARTICLE MEASUREMENTS IN AIR POLLUTION CONTROL. *Pennsylvania State Univ., University Park, Center for Air Environment Studies, Proc. Conf. Air Pollution Control Eng. Aspects, Annu., Allentown, Pa., 1971, p. 63-81. 13 refs. (May, Pub. 202-71.)*

The government estimates that 11.5 million tons of industrial pollution is emitted to the air each year. Pollution can effect human health, plant growth, and weather. Also synergism between particulate matter and sulfur dioxide may have adverse physiological effects. Aerosols are two phase systems consisting of dispersed liquid or solid particles in the air. Most air quality standards are written on the basis of concentration rather than particulate size. However size can be an important factor, since particles larger than 10 micron settle and those smaller than this remain suspended and can effect health. The Commonwealth of Pennsylvania has established an air quality standard for suspended particulate matter at 65 micrograms per cubic meter. But many industrial and population centers in Pennsylvania will find this standard difficult to meet. The Dustfall Bucket can be used to measure atmospheric dust by collecting settled particles, usually for a month. Particles below 10 micron can be collected by the High Volume Sampler which uses a packed filter made of glass fibers with 99% efficiency and 50 to 60 cu ft per min flow rates. A 24 hour sampling time is standard. Soiling potential is measured with an Automatic Tape Sampler which pulls air through a circular spot on a tape filter and measures the flow rate. Values, expressed in coefficient of haze per 1000 linear feet, are determined by reading the spot on a Transmissometer. A light microscope can be used to size particles which have been collected by filter membrane filters, or sieves. Frequency distribution of particle size do not lend themselves to statistical interpretations. Also, light scattering can be used to study aerosols and various instruments can be designed. Particles can be measured for both concentration and size distribution with an impactor and an electrostatic sampler. Research is being done to computerize the entire process and identify the chemical composition of particles. A scanning electron microscope is being used in this work.

11564 APTIC NO. 29386

Matsushita, Hidezuru, Yoshio Egami, and Takashi Handa

SIMPLE ANALYTICAL METHOD FOR BENZ(A)PYRENE IN DUST FLOATING IN ATMOSPHERE. *(Taiki fuyu funjinchu no bentsu (a) puren no kani bunsekiho). Text in Japanese. Preprint, Japan Chemical Society, Tokyo, 1p., 1971. (Presented at the Japan Chemical Society Annual Meeting, 24th, March, 1971, Paper 3347.)*

A simple and rapid method for the analysis of benz(a)pyrene is presented. A few mg of dust from the atmosphere are trapped by a high volume sampler. Polycyclic-aromatic hydrocarbons are extracted from the dust using vacuum sublimation extraction (300 C, 0.01 mm Hg, 40 min). The sample solution is put into a cell, excited at 363.0 millimicrons and by using the narrow base line method, the intensity of fluorescence at 403.5 microns is found. Nitrogen gas is then passed through the sample solution to eliminate the dissolved oxygen, and the intensity of fluorescence is then found again. A formula for the concentration of benz(a)pyrene was obtained. Twenty-seven samples of atmospheric dust in Ichihara city and Kawasaki city were analyzed, by a conventional method and by the new method. A very high correlation was found between the two.

11565 APTIC NO. 29419

Tanaka, Katsuhiko, Katsuhisa Fukaya, Noriyoshi Ashiya, Shozo Fukui, and Saburo Sugano

ANALYSIS OF LEAD IN GASOLINE AND TRANSITION OF THE LEAD CONTENT. *(Gasorin chu no namari no bunsekiho to ganyuryo no suii). Text in Japanese. Preprint, Safety Engineering Society of Japan, Tokyo), 3p. 1970. (Presented at the Safety Engineering Society, Research Presentation Meeting, 3rd, Tokyo, Japan, Dec. 9-10, 1970, Paper 22.)*

An atomic light absorbency analysis device was used to determine quantitatively the tetraethyl lead contained in gasoline without the extraction required for the gravimetric method. Using methyl isobutylketone (MIBK) as a solvent, the sample gasoline is diluted for a 1 to 20-100 dilution (D). Using this solution as the test solution, its absorbency (A) is measured. Meanwhile, a specified amount of the standard lead solution produced from lead nitrate (dissolved in 10% nitric acid) is adjusted to PH 7-9 and added to a diethyl dithiocarbamic acid sodium (DDTC). The test solution is extracted from this solution by means of MIBK, and then its absorbency (A sub s) is measured. Also measured in a blank test solution are the absorbency of MIBK (A sub o) and that of the 10% nitric acid solution (A sub so). The quantity of lead in gasoline can then be calculated by the formulas: C (lead in terms of g/l) equals 10D(A-A sub o/1000 (A sub s-A sub so) and C prime (tetraethyl lead in ml/l) equals C (1/1.056).

11566 APTIC NO. 29427

Schneider, Frank L.

SAMPLING PROBLEMS IN AIR POLLUTION ANALYSIS. *Environ. Res., 3(5-6):452-459, Dec. 1970. 14 refs.*

The most obvious problems of sampling for air pollution were reviewed. Some sampling procedures fail to collect all of the pollutant. There may also be changes, physical and chemical, in the pollutant which are attributable to the sampling procedure. Some sampling procedures also fail to relate the conditions of the sample to the conditions of the original source. Many sampling procedures permit or result in false or double effects. Not all sampling procedures permit the evaluation of properties important or even critical in regulation and control, other than measurement of quantity, such as bulk density of solid aerosol, cohesiveness, magnetic susceptibility, and thermal and electrical conductivity. An important failure in many sampling techniques is not providing for the effect of other components in the polluted gas whether these are recognized as pollutants in the legal sense of the word or contribute to the efffect of the pollutant, either directly or in the analytical procedure. The sampling procedure may open the door to misinterpretation of true and correct values for the pollutant. Priority should be given to the critical study of sampling so that the results of the analytical procedures which are adopted as standard, will be meaningful and not surrounded by limiting qualifications which may deprive them of real value.

11567 APTIC NO. 29428

Henning, Herbert and Siegfried Kliemann

PRECIPITATION AND FOG FORMATION THROUGH COOLING TOWERS. *(Niederschlags- und Nebelbildung durch Kuhlturmen). Text in German. Energie Tech., 23(4):112-115, 1971. 14 refs.*

The warm and water-vapor-saturated plume leaving a cooling tower mixes with the cooler ambient air. Fog is formed by condensation of the water. Apart from direct water emission, the condensation processes are a secondary cause of precipitation. For water condensation from the plume, the air containing the water vapor must be cooled to the dew point and it must contain condensation nuclei on whose surface the condensation can set in. The water emission and fog formation can hardly be controlled by changing the design or the operating conditions of cooling towers. Reduction of the fog plume can be achieved by installation of a dry cooler parallel to the wet cooler. Constructional details of such combination are presently being worked out. Droplet emission by cooling towers can be measured by a throttle calorimeter, a cyclone of the type MAG Balcke, and by various other concentration measurement methods. With the throttle calorimeter, the total emission can be determined through a grid measurement; with the cyclone, that fraction of droplet emission is measured for which the manufacturer of the cooling tower is responsible. The cyclone operates according to the principle of dust measurement. In the throttle calorimeter considerable underpressure is maintained behind the throttle which causes post evaporation of the water droplet in the sample with corresponding temperature drop which is measured. The droplet quantity in the sample can then be calculated.

11568 APTIC NO. 29436

Kiyoura, Raisaku, Hiroshi Mizusawa, Kunio Imai, Haruo Kuronuma, and Yoshisuke Uenishi

REVIEW OF DIRECT MEASUREMENT METHOD OF SULFURIC ACID MIST IN ATMOSPHERE. *(Taiki chu no ryusan misuto no chokusetsu sokuteiho no kento). Text in Japanese. Preprint, Japan Chemical Society, Tokyo, 1p., 1971. 1 ref. (Presented at the Japan Chemical Society Annual Meeting, 24th, Tokyo, March 1971, Paper 3406.)*

The establishment of a measurement method for sulfuric acid mist, has been desired. So far, such methods as trapping sulfuric acid mist with filtering paper, measurement of the electrical conductivity of the liquid, or diffusing, have been reported, but none a selective, accurate quantitative analysis, or simple to handle. An attempt was made to trap the dust containing sulfuric acid mist by dry impinger method. The method adopted by Scaringelli et al. was reviewed, and the modified method has been proposed. After dried nitrogen gas is let through fuming sulfuric acid, and is contacted with the air, with a certain steam pressure, the sulfuric acid mist is generated. It is then let in the device connecting the dry impinger and filter. The slide set under the nozzle of the impinger impacts and traps sulfuric acid mist. The untrapped mist is trapped by the filtering paper later. The trapping effectiveness of the impinger was checked, by changing the nozzle diameter, di, of the impinger, distance between nozzle and slide, dis; concentration of SO3, C; steam pressure, P; and velocity, V. As a result, under the condition of di equals 0.25 cm, dis equals 0.1 cm, C equals 3 ppm, P equals 1 Omm Hg, V equals 10 l/min, the effectiveness was about 90%. Therefore, this method will do, as a simple trapping method. A glass fiber slide was used but a check is being made on copper plates. The dust trapped contains metal sulfates, etc. Scaringelli et el. heated it in nitrogen gas, and evaporated only sulfuric acid mist separating it from other dusts. Evaporated sulfur trioxide was reduced by copper and measured as sulfur dioxide. However, no detailed report has been made as to the conditions of manipulation, so that in this study, separation and reduction temperatures of sulfuric acid mist were checked. The device consists of a quarz tube, with 3 cm inner diameter, 1 m long, and 35 cm long separation furnace and 30 cm reduction furnace which can be heated independently of each other. The sample enters the separation furnace, and sulfuric acid is evaporated. Sulfur trioxide is generated and sent to the reduction furnace by nitrogen gas. Twenty mesh copper net, which was hydroge reduced overnight at 900 C was used. A certain quantity of 103N sulfuric acid was taken by micro-syringe and was made the standard sample. Scaringelli et al. used the separation furnace at 400 C, but in this study, quantitative analysis could be made at 200 C. Although Scaringelli repored that the separation furnace was at 500 C, in this study, at 700 C, no reduction occurred, and at 800 C nearly complete reduction occurred.

11569 APTIC NO. 29442

Levaggi, Dario A., Evaldo L. Kothny, Theodore Belsky, Emil R. DeVera, and Peter K. Mueller

A PRECISE METHOD FOR ACCURATELY ANALYZING THE CONTENT OF NITROGEN OXIDES IN THE ATMOSPHERE. *Inst. of Environmental Sciences, Mt. Prospect, Ill., Proc. Inst. Environ. Sci. Annu. Tech. Meet., 17th, Los Angeles, Calif., 1971, p. 353-355. (April 26-30.)*

Nitric oxide and nitrogen dioxide in the air were analyzed by chromium trioxide (CrO3) and triethanolamine (TEA). When TEA was added to a mesh firebrick as a 20% solution in water and used on a molecular sieve with soda lime as a back-up absorber, it absorbed NO2. Chromium trioxide was tested as a possible replacement for th potassium permanganate-sulfuric acid solutions designed to oxidize NO for conversion to and detection of NO2. Its oxidation efficiency was close to 100%. Humidity had little effect on TEA an CrO3. The simultaneous use of TEA and CrO3 for the continuous analysis of ambient nitric oxides has several advantages: the absence of negative values of NO concentrations; a more constant an reliable oxidation efficiency; and existing analyzer installations can be converted easily without capital outlay.

11570 APTIC NO. 29446

Kendall, B. R. F. and Gladys Englehart

NEW TYPE OF MOLECULAR MASS GAUGE FOR USE WITH SMALL GAS SAMPLES. *Rev. Sci. Instr., 41(11):1623-1628, Nov. 1970. 5 refs.*

A simple, compact molecular mass gauge was developed with an output reading directly in atomic mass units. Gas was injected into a series of chambers interconnected by porous membranes. Since free molecular flow conditions applied, the resultant output pressure waveform was characteristic of the injected gas. This can be used with a small gas sampler to measure molecular weights in less than 1 min with a standard deviation of about 1 part in 2500. The theory, design, construction, and operation were discussed. Sample volumes were typically about 1.0 cu cm but can be several orders of magnitude smaller. Calibration for analyzing two component gas mixtures was also discussed. Two fundamentally different modes of operation were identified, corresponding to homogeneity and inhomogeneity of the gas within each chamber; the latter mode gave a more linear calibration. (Author abstract modified)

AIR QUALITY MEASUREMENTS

11571 APTIC NO. 27275

Mammarella, Luigi, Stanislao Zazo, and Francesco Benvenuti

COMPARATIVE CHARACTERIZATION OF URBAN AND RURAL AIR POLLUTION BY A SERIES OF INTERSEASONAL SAMPLING CYCLES. *(Caratterizzazione comparative dell'inquinamento atmosferico urbano ed extraurbano attraverso una serie di cicli di campionamento interstagionali). Text in Italian. Securitas (Rome), 55(2-3): 155-186, 1970. 40 refs.*

Air pollution conditions were compared in two Italian localities in April and October of 1968 and in February 1969. The first sampling site was the University City area of Rome; the second was a sparsely populated area about 25 miles south of Rome, the closest communities being Monte Porzio and Frascati. The services of a biotechnology research center, operating in this area, were utilized. Samples were taken for a period of 5 consecutive days in each of the 3 above-mentioned months. The sampling had to do with particulate pollution in the form of aerosols. On the basis of test results it was concluded that the Monte Porzio site should be considered as a future 'standard' against which to check the air pollution measurements of other localities. Its 'low pollution index' is attributed to several factors: its isolation from large population centers and agricultural economy, its remoteness from pollution sources (the nearest being a super highway, whose closest point is more than one-half kilometer away), meteorological conditions (multidirectional air movement and moderate wind velocity) conducive to air purity, and the almost complete nonexistence of inversion phenomena in the area.

11572 APTIC NO. —

Kohgo, Tetsutaro and Tatsunori Oyake

STUDIES ON SOME STATISTICAL ANALYSIS OF DUSTFALL IN HOKKAIDO. *(Koka baijinryo no tokeiteki kansatsu). Text in Japanese. Hokkaido Ritsu Eisei Kenkyshoho, vol. 20:166-181, June 1970. 7 refs.*

Results are presented for the statistical analysis of total dust fall measured in various cities in Hokkaido. The seasonal frequency distribution of dust fall collected in each city over a two to four year period clearly shows that the amount of dust fall is larger in warm weather than in cold weather. The monthly and yearly geometric means of dust fall in the different cities are smaller than the monthly and yearly arithmetic means. Within the confidence limits, these differences are insignificant because the larger the measuring area, the greater the difference between two means. When 't' (the significance ratio) is computed, there is no significant difference between yearly variations in dust fall in the different cities. According to the confidence limits, a typical measuring site in a city with many industries should be located in the business district and at a point a little distant from the industrial district. In other cities, the site should be in the central part of the city.

11573 APTIC NO. 27380

Milford, S. N., G. C. McCoyd, L. Aronowitz, J. H. Scanlon, and Conrad Simon

AIR POLLUTION MODELS OF THE NEW YORK/NEW JERSEY/CONNECTICUT AIR QUALITY REGION. *Preprint, Air Pollution Control Assoc., Pittsburgh Pa., 48p., 1970. 8 refs. (Presented at the Air Pollution Control Association Annual Meeting, 63rd, St. Louis, Mo., June 14-18, 1970, Paper 70-77.)*

Progress is reported on development of a series of computer models for predicting air quality which have a shorter time scale than climatological models and which are capable of providing better recommendations for control and planning while using currently available input data. The basic dispersion model is a steady state, non-divergent Gaussian-type used with a modified inventory of sulfur dioxide sources based on published data for the N. Y./ N. J./Conn. Air Quality Region. Various internal sensitivity analyses of the model are described in which the variation produced in the pollutant concentration by a given change in each of the contributing factors (wind speed, wind direction, mixing depth, stability conditions, source strengths, and grid size for the area sources) is isolated. In addition, validation tests of the model have been made against the July and Aug. 1969 data for the ten telemetering stations of the New York City Aerometric Network. Hourly as well as more averaged concentrations were considered. Various sets of meteorological data from the network stations and the three area airports, were compared and tested. From the result of both the sensitivity analyses and the validation tests a series of preliminary conclusions are discussed. Additional tests, particularly for the winter season, are needed to substantiate these conclusions. (Author abstract modified)

11574 APTIC NO. 27408

Bank, Marvin and Douglas M. McEachern

A CARBON MONOXIDE PROFILE OF A MAIN ARTERY IN MEXICO CITY. *Preprin Air Pollution Control Assoc., Pittsburgh, Pa., 16p., 1970. (Presented at the Air Pollution Control Association, Annual Meeting 63rd, St. Louis, Mo., June 14-18, 1970, Paper 70-13.)*

Unusually favorable conditions for the production and retention of atmospheric pollution in Mexico City include many factories with uncontrolled smoke emissions, large numbers of old, poorly tuned automobiles using low-grade, high-sulfur content fuels, many diesel motors, wide-spread trash burning, and fuel oil use for heating. Also, the city is surrounded by mountains and the natural air flow is minimum, while the altitude of 7100 feet and a large percentage of sunny days contribute to the importance of photochemical smog. Preliminary carbon monoxide concentrations sampled in November 1969 along the Paseo de la Reforma showed levels of about 45 ppm in areas where this street is about 150 feet wide. In the downtown area this street narrows to only three lanes and is about 40 feet wide, lined with 5-story buildings. Here, 100 ppm of CO was recorded, and a high of 190 ppm at the entrance of a parking garage. Traffic density was moderate at the time.

11575 APTIC NO. 27466

Toyama Prefecture (Japan), Dept. of Public Nuisance

AIR POLLUTION IN TOYAMA PREFECTURE. *(Toyama-ken no taikiosen). Text in Japanese. 84p., Oct. 1970.*

The pollution in Toyama prefecture is mainly the air pollution caused by the smoke exhausted from electric furnaces of the ferroalloy manufacturing factory. From Nov. 1965 to March 1970, settling particles (deposit gauge method), sulfur dioxide (PbO2 method, electric conductivity method), suspended particulates (digital indicator) weather, and related parameters were measured at Toyama city, Takaoka city and Shinminato city, and their results are reported. The dust fall increased in 1969, because the absolute quantity is increasing with the increasing production, even though the point source concentration is decreasing. The average values in 1969 were 10.0 t/sq km/mon. at Toyama city, and 17.7 at Takaoka city. The concentration of sulfur dioxide is increasing year by year, and in 1969, it showed the average value of 0.61 mg/100 sq cm/day at Toyama city, and 0.50 mg at Takaoka city, which is lower than the other industrial area. In monthly changes, all decreased in winter except 2 measuring points. The quantity of suspended particulates in 1969 was 122 microgram/N cu m at Takaoka city and 63 microgram at Toyama city. Twenty-eight harmful substances defined by Air Pollution Prevention Act are also measured.

11576 APTIC NO. 27478

Ascah, R. and S. Russ

AIR POLLUTION IN MONTREAL. *Water Pollution Control (Toronto), 109(2):48-50, Feb. 1971. 1 ref.*

The average concentration of carbon monoxide in the middle of downtown streets in Montreal is 27 ppm, while a CO level of 15 ppm is sufficient to cause a lowering of visual ability and an impairment of ability to judge time. Hemoglobin has an affinity for carbon monoxide that is 200 times greater than for oxygen, and the effects of carboxyhemoglobin are mentioned. While the allowable yearly average of sulfur dioxide in the Montreal urban community is 0.02, the yearly average for 11 sampling stations for 1967-1968 was 0.034 ppm. The following year it increased to 0.42 ppm, and during inversion periods it is often above 0.10 for days.

11577 APTIC NO. 27491

Oshino, Akira, Yasumasa Kumazawa, Nobuko Akashi, Toshihiro Okuno, Ken'ichiro Yoshimura, Yoshinari Kurosaka, Kaori Inoue, Keisuke Taguchi, Fujihiko Go, and Kenji Oka

MONITORING THE ATMOSPHERIC DUST FALL AND SULFUR DIOXIDE BY LEAD CANDLE IN OSAKA PREFECTURE, JANUARY 1969-DECEMBER 1969. *(1969 nen (1 gatsu - 12 gatsu) kokabaijin narabini nisankanamariho ni yoru aryusan gasu no sokutei kekka). Text in Japanese. Osaka-fu Kogai Kanshi Senta Chosashitsu Kenkyu Hokoku (Proc. of the Res. Sect. Osaka Environ. Pollution Control Center), 1(1):43-46, July 1970. 2 refs.*

In a continuing program of sulfur dioxide and dust fall measurements in Osaka Prefecture, data collected from January, 1969 through December, 1969 are reported. Seventeen sampling stations were located in total in the following cities: four stations each in Toyonaka and Higashi Osaka, three in Ikeda, and one each in Osaka Fukida, Moriguchi, Yao, Matsubara and Habikino. The results of the measurement of levels of atmospheric dust fall (dust jar method) were as follows: among the yearly averages of each sampling station, the highest recorded was 13.77 t/sq km (Toyonaka city I) and the lowest was 6.06 t/sq km (Toyonaka city II). The highest average level of sulfur dioxide measured by the PbO2 method was recorded 3.04 SO3 mg/day/100 sq cm (Toyonaka city III) and the lowest was 0.66 mg (Toyonaka city II).

11578 APTIC NO. 27499

Endo, Ryosaku, Tatsunon Oyake, Yutaka Matsumoto, and Tetontaro Kogo

STUDIES ON THE URBAN ATMOSPHERIC POLLUTION BY AUTOMOBILE EXHAUST GAS IN CITIES OF HOKKAIDO. PART 5. ON THE MEASUREMENT OF CARBON MONOXIDE AND TOTAL HYDROCARBON BY AUTOMATIC CONTINUOUS APPARATUS. *(Hokkaido no toshi ni okeru jidosha haiki gasu no taikiosen ni tsuite. Dai 5 ho. Jidosokutei kiroku no chosa ni tsuite). Text in Japanese. Hokkaido Ritsu Eisei Kenkyushoho, no. 20:182-190, June 1970. 11 refs.*

The carbon monoxide, and the total hydrocarbon (THC) concentration on the roadside in the urban area of Otaru, Asahikawa, Sapporo, Tomakomai and Muroran Cities was measured continuously by automatic apparatuses in summer, 1969. The CO apparatus was the nondispersiv infrared analyzer and the THC was the flame ionization analyzer. The THC concentration was shown as propane. The average of vehicle passing through in the daytime (8-18 hr) was 2253/hr in Otaru, 1869/hr in one survey point (A) of Asahikawa, 2154/hr in other point (B) of Asahikawa, 4192/hr in Sapporo, 214/hr in one point (C) of Tomakomai, 1863/hr in other point (D) of Tomakomai and 773/hr in Muroran. The average concentration of CO in the daytime was 18.2 ppm in Otaru, 9.5 ppm in A of Asahikawa, 3.9 ppm in B of Asahikawa, 9.1 ppm in Sapporo, 3.9 ppm in C of Tomakomai, 4.0 ppm in D of Tomakomai and 8.3 ppm in Muroran. The maximum hourly average value was 39.2 ppm in Otaru, 16.1 ppm in A of Asahikawa, 6.7 ppm in B of Asahikawa, 17.8 ppm in Sapporo, 6.5 ppm in C of Tomakomai, 6.0 in D of Tomakomai and 13.8 ppm in Muroran. The average concentration of THC in the daytime was 1.8 ppm in Otaru, 1.05 ppm in A of Asahikawa, 0.76 ppm in Sapporo, 0.34 ppm in C of Tomakomai, 0.39 ppm in D of Tomakomai and 0.64 ppm in Muroran. The maximum hourly average value was 4.56 ppm in Otaru, 1.79 ppm in A of Asahikawa, 1.33 ppm in Sapporo, 0.55 ppm in C of Tomakomai, 0.78 ppm in D of Tomakomai and 1.10 ppm in Muroran. A high correlation was found between the concentration of CO and THC. The concentration of THC appeared about 1/10 of CO. The atmosphere on the roadside in Otaru was more contaminated than other cities. The width of the road at this survey point was comparatively narrow. The atmosphere in Asahikawa, Sapporo and Muroran was considerably contaminated, but B of Asahikawa, and C and D in Tomakomai were comparatively low. Otaru was over the threshold limit values of the air pollution standard for CO, determinated by the Japan government in February, 1970.

11579 APTIC NO. 27620

Yocom, John E., William L. Clink, and William A. Cote

INDOOR/OUTDOOR AIR QUALITY RELATIONSHIPS. *Preprint, Air Pollution Control Assoc., Pittsburgh, Pa., 43p., 1970. 2 refs. (Presented at the Air Pollution Control Association, Annual Meeting, 63rd, St. Louis, Mo., June 14-18, 1970, Paper 70-119.)*

Air quality data were gathered for suspended and soiling particulates, carbon monoxide, and sulfur dioxide at two points inside and two outside of a pair of private homes, public buildings and office buildings during the 1969 summer; each pair of buildings was sampled simultaneously for two weeks. A brief preliminary program was also conducted during winter 1969 to verify techniques and assess the effects of heating and cooking systems in private homes on indoor pollutant levels. Two self-contained mobile instrument trailers constructed for the program each included a central vacuum pump for particulate filters, paper-tape soiling samplers, an SO2 conductimetric analyzer, an infrared analyzer for CO, and a master control unit for cycling the sampling through four points and to establish 2 and 12-hr sampling intervals. In homes with gas heating and cooking, the heating system had no effect on CO levels while gas stoves did have a significant effect. Attached garages having a door opening from the garage directly to the house are also a significant source of indoor CO. Suspended particulates most readily penetrated private homes and could be removed by air conditioning systems. During winter, it appears that SO2 penetrates structures and diffuses into their interiors to variable degrees which may depend on atmospheric stability and level of activity inside the structure. Daily activity greatly influences particulate levels and urban CO levels. Internal generation of pollutants was a significant factor in measured interior concentrations in some of the structures sampled.

11580 APTIC NO. 27621

Harrison, Paul R. and John W. Winchester

AREA-WIDE DISTRIBUTION OF LEAD, COPPER, AND CADMIUM IN AIR PARTICULATES FROM CHICAGO AND NORTHWEST INDIANA. *Preprint, Air Pollution Control Assoc., Pittsburgh, Pa., 29p., 1970. 9 refs. (Presented at the Air Pollution Control Association, Annual Meeting 63rd, St. Louis, Mo., June 14-18, 1970, Paper 70-118.)*

As a first attempt to examine the area-wide distribution of specifi chemical elements in aerosol particles along the southwest shore of Lake Michigan, lead, copper, cadmium, and bismuth were determined in 24-hr average samples collected on glass fiber filters at 50 stations throughout the region. Samples from most of the stations were obtained from local air pollution control organizations for 6 different days from May to Aug. 1968 and were analyzed electrochemically by highly sensitive anodic stripping volumetry. Throughout the area the small variation of lead, generally a few micrograms per cubic meter of air, did not exceed that expected from the distribution of automobiles, the major source. Cadmium wa generally 200 times lower without marked local variations and was close to the expected concentration if coal combustion is the major source. Copper was generally 20 times lower than lead throughout Chicago as expected if coal combustion is the major source of copper. However, certain stations in the northwest Indiana area showed reproducible anomalies where copper was 100 times greater than in Chicago and several times greater than lead at the same stations. The source of this anomalous copper has not been determined. Results were compared with data from the National Air Sampling Network stations in the area for 1963. Cadmium falls within the variability presented by the NASN data, as does bismuth. Lead and copper are both higher than the NASN data, for unknown reasons. Area-wide studies are useful in revealing the general exposure level of pollutants, previously unknown contaminants and sources, and better locations for monitoring stations. (Author abstract modified)

11581 APTIC NO. 27636

Harrison, P. R., K. A. Rahn, R. Dams, J. A. Robbins, J. W. Winchester, S. S. Brar, and D. M. Nelson

AREAWIDE TRACE METAL CONCENTRATIONS IN NORTHWEST INDIANA AS DETERMINED BY MULTIELEMENT NEUTRON ACTIVATION ANALYSIS: A ONE DAY STUDY. *In: I. Occurrence of Halogens in Atmospheric Aerosols and Precipitation. II. Air Pollution Inputs of Trace Metals to Lake Michigan. Michigan Univ., Ann Arbor, Dept. of Meteorology and Oceanography, Michigan Univ., Ann Arbor, Great Lakes Research Div., Argonne National Lab., Ill., Biology Div., and Argonne National Lab., Ill., Radiological Physics Div., AEC Contract AT(11-1)-1705, ORA Proj. 08903, PR-3, 58p., May 1970. 18 refs.*

A series of 24 hour high volume air particulate samples, collected June 11-12, 1969 at 25 locations in the northwest Indiana area, has been analyzed by nondestructive neutron activation analysis for 30 trace elements. Use of germanium (lithium) gamma-ray spectrometry and computer assisted data reduction, combined with 2-4 replications of each analysis, yielded precise results which allowed a study of the geographical distribution patterns of the elements. Some elements, such as sodium, potassium, titanium, aluminum, samarium, and europium, show only minor concentration variations over the area, while others, such as copper, tungsten, chromium, zinc, antimony, gallium, bromine, silver, iron, and cerium, show large variations, indicative of important local sources. Similar distribution patterns and high correlation coefficients suggest common sources for several elements. Influenc of meteorological conditions and the potential Lake Michigan pollution hazard are discussed. (Author abstract modified)

11582 APTIC NO. 27643

Tokyo Metropolitan Government (Japan), Air Pollution Study Group, Yokohama Municipal Office (Japan), Air Pollution Study Group, Kawasaki Municipal Office (Japan), Air Pollution Study Group, Chiba Municipal Office (Japan), Air Pollution Study Group, Kawaguchi Municipal Office (Japan), Air Pollution Study Group Kanagawa Prefecture (Japan), Air Pollution Study Group Chiba Prefecture (Japan), Air Pollution Study Group, and Saitama Prefecture (Japan), Air Pollution Study Group

AIR POLLUTION ADMINISTRATION PLAN. *(Taikiosen kanri keikaku ni kansuru kenkyu). Text in Japanese. Japan Ministry of Health and Welfare Rept. for 1969, 115p., March 1970. 5 refs.*

In order to obtain some data to establish the air pollution zone administration plan in one metropolis, three prefectures, and five cities (Tokyo, Kanagawa Prefecture, Chiba Prefecture, Saitama Prefecture, Yokohama city, Kawasaki city, Chiba city, and Kawaguchi city), the following were reported: (I) the relationship between the levels of air pollution and the atmospheric conditions when the levels of sulfur dioxide are high; and (II) the distributions of the origination sources of SO2. In study (I), Dosage (levels of pollution integrated by time) and DAP (Dosage Area Product, calculated by drawing a line indicating the Dosage value and multiplying the average Dosage value in the region encircled by the lines by its area and then adding were applied. At the ten test stations in one metropolis, three prefectures, and five cities, Dosage was calculated every day, and a remarkable relationship was found between Dosage and the highest levels of pollution; however, in summer, high levels of pollution appeared fo a short time and in winter, the highest levels lasted for a long time so that the Dosage value inclined to become large. Next, the time zone of high levels of pollution and the conditions of wind were analyzed and then DAP was calculated: in summer, DAP was lower compared with winter, and in case of increase, there were timely disagreements; but in winter, high levels spread out in wide regions from the morning, and when high Dosage regions appeare they lasted all day long. Moreover, the levels of SO2 at the two test stations in Tokyo, the geometrical mean and the geometrical standard variation were calculated. In (II), the state of the equipments originating smoke and the state of the chimneys of the factories from which cooperation is requested at urgency were reported.

11583 APTIC NO. 27648

Nagata, Masanobu, Shigeru Yamada, Fujio Tomoto, and Jun Fukuda

THE AMOUNTS OF FLOATING AND FALLING DUSTS, AND ANALYSIS OF THEIR MENTAL COMPONENTS IN KAWASAKI CITY. *(Kawasaki-shi ni okeru fuyufunjinryo to kinzoku seibun no bunseki kekka). Text in Japanese. Nippon Koshu Eisei Zasshi (Japan J. Public Health), 17(12):551, Oct. 1970. (Proceedings of the Japanese Society of Public Health, Annual Meeting, 28th.)*

In three districts in Kawasaki city (A; industrial area, B: commercial area; and C: residential and commercial area), floating dust was collected by high-volume air samplers and was measured during the period from December 1969 to May 1970. Metal components in floating dusts were analyzed by atomic absorption spectrometry. The mean value of floating dusts per month was generally high in all districts: 409 micrograms/cu m in A; 316 micrograms/cu m in B; and 276 micrograms/cu m in C. Falling dusts in B area were 1.3 times higher than those in C area (8 t/sq km/month); in A area, they were 3 times higher than those in C area. The number of days when floating dusts were less than 150 micrograms/cu m was zero in A, 1 day in B, and 2 days in C. The minimum values were recorded in rainy days in all areas. Levels of iron, lead, manganese, zinc, cadmium, copper, and chromium were measured. The levels of all these metals were high in A area; especially iron showed a high level. The values in A area were 2 3 times higher than those in B and C areas.

11584 APTIC NO. 27672

Takasago Municipal Office (Japan), Economic and Social Dept.

AIR POLLUTION. *(Taiki osen). Text in Japanese. In: The Outline of Pollution. Kogai no gaikyo. Takasago, Takasago Municipal Office, July 1970, Chapt. 1.*

In order to grasp the reality of air pollution in Takasago city, Hyogo Prefecture, investigations on the levels of atmospheric dust fall, sulfur dioxide (period of investigation: 1964-1969), airborne dust, exhaust gas from motor cars (1969), atmospheric conditions, and fuel consumption were carried out. The levels of atmospheric dust fall in the city recorded highest in 1966, marking a yearly average level of 8.5 t and was decreasing henceforth; but in 1969, the levels showed 6.2 t which was a 10% increase compared with the previous year. The levels of sulfur dioxide measured by the PbO2 method decreased since 1965; the yearly average level in 1969 was 0.49 mg. As to the levels of sulfur dioxide measured by the electroconductivity method, the yearly average level of 1969 was within 0.025-0.028 ppm. High levels were observed in winter and summer. The comparison of the PbO2 method with the electroconductivity method is as follows: ppm equals 0.053 times mg SO3 (1 ppm equals 18.9 mg) (standard variation: 0.016). A relationship was observed between the frequency of (significant) wind direction and the daily average level of sulfur dioxide, except for one sampling station. Concerning the levels of air borne dust measured by digital method, the yearly average level of 1969 recorded 0.24 mg/cu m. A significant relationship was presumed between the levels of air borne dust and the levels of sulfur dioxide. The quantities of the fuel consumed were as follows: coal 1,140,000 t, crude petroleum - 339,000 t, which when compared with the previous year are three times as much and a 20% increase respectively. In July 1969, horizontal aerial current was investigated using small balloons and vertical aerial current was investigated by applying pilot balloons. As to the exhaust gas from motor cars, the levels of CO, nitric oxide, nitrogen dioxide, SO2, atmospheric dust fall, and compounds of lead were measured at two sampling stations.

11585 APTIC NO. 27673

Hiroshima Prefectural Government (Japan), Dept. of Hygiene

AIR POLLUTION IN HIROSHIMA PREFECTURE. 1ST REPORT. *(Hiroshima- ken ni okeru taikiosen. Dai 1 po). Text in Japanese. 374p., Feb. 1970.*

Air pollution caused by soot and dust has become a social problem in Hiroshima Prefecture, both in Otake city (where the main industries are paper manufacturing and petrochemicals) and in Kure city (with iron and steel and shipbuilding industries). Environmental investigations were carried out by the municipal authorities concerned, and fundamental investigations by the prefectural authorities, in order to designate the polluted areas as defined under the anti-pollution law. Based on the results of these investigations, Otake city was designated as suffering from air pollution from March 1968, and Kure city from March 1969. The extent of air pollution has subsequently been kept under continuous surveillance. This report describes the results of the fundamental survey of the designated areas carried out by the prefectural authorities, and the basic survey of air pollution carried out by the municipal authorities, divided into regional groupings of 8 districts in Hiroshima Prefecture (Otake, Kure, Fukuyama, Mihara, Hiroshima, Onomichi, Takehara, and Fuchu city). The results of controls established under the anti pollution law and a survey of specific harmful substances are also given.

11586 APTIC NO. 27684

Nagoya Municipal Office (Japan), Dept. of Hygiene

THE PRESENT STATUS OF AND MEASURES AGAINST PUBLIC NUISANCE. *(Kogai no genkyo totaisaku). Text in Japanese. 42p., Nov. 1970.*

The general state of various types of public nuisances in Nagoya are presented. Air pollution, including sulfur oxides, settling dusts, and automobile exhaust gas, and water pollution, as well as noise and vibrations are topics covered. Guidance for sources of pollution, disposition of complaint litigations, the status of special public nuisance facilities, and loans and subsidies are other major subjects. Another section deals with the public nuisance control measures and administration for 1970. For air pollution, the measurements at various points in Nagoya show that the annual average concentration of sulfur oxides was about 0.5 ppm or less. This is probably due to meteorological conditions rather than the amelioration of pollution. With the present development of the coast industrial complex, the future air pollution outlook in Nagoya is not very good. Measurements for sulfur oxides have been conducted since 1961 by the lead peroxide candle method and since 1965 by an automatic recording devices. Various data are tabulated and graphically presented, including the quantity of sulfur dioxide, settling dusts, sulfur dioxide by area, and automobile exhaust emission measurements at Sakae traffic intersections.

11587 APTIC NO. 27911

Comprehensive Planning Bureau, Japan, Osaka Municipal Office

PUBLIC NUISANCES IN OSAKA: PRESENT STATUS AND CONTROL. 2. AIR POLLUTION. *(Osaka-shi no kogai no genjo to sono taisaku. Dai-2-ho. Taiki osen). Text in Japanese. 35p., July 1970.*

Data on air pollution in Osaka and other parts of the country are presented for comparison purposes. The data include transition of sales figures for coal and heavy oil from 1958 to 1968, annual variation in the total amount of dusts in Osaka (1959-69), the amount of settling dusts in Osaka in industrial, semi-industrial, commercial, and residential districts, measured by dust jars, annual variation of sulfur dioxide concentration measured by PbO2 method, annual variation in the number of thick smog-fog days in Osaka, distribution of settling dusts at various sections of Osaka (Jan. -Dec. 1969) measured by dust jars, detailed comparison of air pollution concentration in Osaka and the environmental standards, concentration of sulfur oxides by electroconductivity method, and suspended dusts by digital dustmeter for every month in 1969 according to industrial, semi-industrial, commercial, and residential districts. Other items include concentration of carbon monoxide from automobile exhaust gas measured at monitoring stations, pollution of the air in the streets due to automobile exhaust gas, and the annual variation in the number of automobiles and traffic congestions in Osaka Prefecture.

11588 APTIC NO. 28629

Hasegawa, T., A. Sugimae, and J. Fujii

TRACE METALS IN SUSPENDED PARTICULATES. PART IV. *(Fuyu funjinchu no kinsoku seibun. Dai-4-ho). Text in Japanese. Taiki Osen Kenkyu (J. Japan Soc. Air Pollution), 5(1):211, 1970. (Proceedings of the Japan Society of Air Pollution, Annual Meeting, 11th, 1970.)*

Suspended dusts were collected with a high-volume air sampler and analyzed by spectrophotometry for metals such as iron, lead, manganese, vanadium, tin, nickel, and copper. A good correlation between the concentration of vanadium emitted during heavy-oil combustion and sulfur oxides was obtained. The daily variation of vanadium concentration and suspended particulates shows that wind direction and wind speed have a large bearing on the vanadium particles. Good correlation was also seen between the concentration of iron and the total particulates concentration: for the total particulates concentration of 100 micrograms/cu m, there were 1-7 micrograms/cu m of iron. The reason for the relationship is not really clear because there are so many sources of iron emissions. Forty percent or more iron particles were over 8 micron in size and 80-90 percent of the vanadium and lead particles were below 2 micron in size. Furthermore, a good correlation was seen between iron and manganese.

11589 APTIC NO. 28812

Clayton, George D., James R. Arnold, and Frank A. Patty

DETERMINATION OF SOURCES OF PARTICULATE ATMOSPHERIC CARBON. *Science, 122(3171):751-753, Oct. 21, 1955. 6 refs.*

A special sampler was constructed to determine the carbon content of particulate matter in the Los Angeles atmosphere during a period of smog; the carbon-14 assay of the samples was measured by a liquid scintillation method. It is well known that particulate matter in the atmosphere influences visibility. Samples were collected at one location in Detroit and one location in Los Angeles. In Detroit, haze, smoke, and fog were moderately light and present during less than 20% of the sampling period. In Los Angeles, both samples were taken during a period of fog and severe haze; complaints of eye smarting were frequent during daylight hours. The total carbon content of each sample was only about 20% of the total weight. Thus, carbon is a minor constituent of the total particulate load found in the Los Angeles and Detroit atmospheres.

11590 APTIC NO. 28835

Yamaguchi Prefecture Research Inst. of Health (Japan)

ON THE AIR POLLUTION IN WAKI, KUGA COUNTY. PART IV. *(Kuga-gun Waki-mura no taiki osen ni tsuite. Dai-4-po). Text in Japanese. Yamaguchi-Ken Eisei Kenkyusho Nenpo (Ann. Rept. Yamaguchi Prefect. Res. Inst. of Health), no. 11:48-49, Aug. 1968.*

Air quality data obtained in Waki, Japan, from January to December 1968 are presented. The maximum value of sulfur dioxide was 1.31 mg SO3/day/100 sq cm lead peroxide, obtained in April at Waki Junior High School. The annual average sulfur dioxide concentration was 0.78 mg. Settling dusts, on the other hand, were at the maximum, 8.9 tons/sq km/month, in July at Waki Junior High School, and the annual average was a relatively low 5.3. It is concluded that air pollution in Waki is mainly of the petrochemical industry type, and is very similar to that in the neighboring city of Iwakuni.

11591 APTIC NO. 28855

Deirmendjian, D.

USE OF SCATTERING TECHNIQUES IN CLOUD MICROPHYSICS RESEARCH. I. THE AUREOLE METHOD. *Rand Corp., Santa Monica, Calif., Contract F44620-67-C-0045, Rept. R-590-PR, 39p., Oct. 1970. 20 refs.*

NTIS, DDC: AD 714582

The aureole around the sun and moon has been known to be a reliable indicator of the presence of aerosol layers in the atmosphere; the reason, of course, is that the diffraction-like forward scattering of light waves by three-dimensional particles, of a finite size relative to the wavelength, is so efficient that a relatively small small number of particles suffices to produce the region of enhanced brightness over the general skylight background, known as aureole. Aureole theory is examined in terms of a first-order perturbation of the well-known Rayleigh scattering field, and the major parameters of the observed aureole are reproduced with the use of polydisperse scattering models. Examples are provided to illustrate the differences between the aureole observed when the sun is high above the horizon and when it is close to the horizon. Also examined are the differences produced by considering nonabsorbing and highly absorbing aerosols. The degree of atmospheric turbidity can best be assessed by comparing the deviations of sky brightness within a ring of a 40 deg radius around the sun with the brightness corresponding to an equivalent Rayleigh atmosphere. The nature of the size distribution of an atmospheric aerosol is closely related to the brightness gradient within a disc of a 10 deg radius around the sun. Both these effects may be analyzed in terms of turbidity models based on polydispersions of Mie particles. (Author summary modified)

11592 APTIC NO. 28882

Bufka, J.

THE OCCURRENCE OF 3,4-BENZPYRENE IN THE ATMOSPHERE OF THE CITY MOST AND OF THE COAL MINES OF THE MOST DISTRICT. *(Vyskyt 3,4-benzpyrenu v ovzdusi mesta Mostu a uhelnych lomu na Mostecku). Text in Czech. Cesk. Hyg. (Prague), 8(6):340-343, July 1963.*

The intense development of surface mining in the brown coal districts of Northern Bohemia has brought with it air pollution caused by toxic fumes from coal fires. The fumes are characterized by the presence of substantial amounts of sulfur dioxide, carbon monoxide, and other products of underground combustion in an atmosphere largely devoid of oxygen. Carried by winds, such fumes pollute the air to the detriment not only of the mining crews, but also of the population in nearby areas. Temperatures of up to some 1000 C in underground smoke-filled fires were suspected of being a source of cancer-producing substances, particularly 3,4-benzpyrene. A total of 100 analyses carried out in 1961/62 confirmed the presen of benzpyrene in the smoke and established its widely varying concentration. A volume of the atmosphere was drawn through a Whatman 1 paper filter 110 mm in diameter; the total volume of air per test varied between 6 cu m and 235 cu m. The filters were then analyzed chromatographically to establish the benzpyrene content, expressed in spectrophotometric gamma units per 100 cu m o air. The results were 222 units maximum from air samples obtained close to a burning seam, 38 units maximum from air above the mining machinery, and 11 units maximum from the city of Most.

11593 APTIC NO. 28920

Lininger, Ronald L., Robert A. Duce, John W. Winchester, and Wayne R. Matson

CHLORINE, BROMINE, IODINE, AND LEAD IN AEROSOLS FROM CAMBRIDGE, MASSACHUSETTS. *J. Geophys. Res., 71(10):2457-2463, May 15, 1966. 10 refs.*

Aerosol particles in Cambridge, Massachusetts, were collected by cascade impactor and analyzed for chlorine, bromine, and iodine by neutron activation and for lead electrochemically. The Casella four-stage impactor selected particles of radius greater than about 0.2-0.5 micron, and two sampling sites were chosen on the M.I.T. campus--on the roof of the 90-meter-high Green Center for Earth Sciences and at the curb by a busy street. The ranges 1 to 6 microgram Cl/cu m STP and 2 to 10 ng I/cu m STP are in good agreement with observations in unpolluted Hawaii air, but the range 20 to 800 ng Br/cu m STP stands an order of magnitude higher and agrees with observations in Washington, D. C., polluted air. Lead concentrations are 0.1 to 2.2 micrograms Pb/cu m STP and are strongly correlated with high Br concentrations during hazy weather and/or curb-site sampling. The data suggest that the initial exhaust product is a particulate lead halide which suffers loss of Br in the atmosphere. (Author abstract)

11594 APTIC NO. 28961

Fibbe, James

SOUTH ALABAMA REGIONAL AIR POLLUTION, 1970. STUDY OF THE AMBIENT AIR QUALITY, AND POLLUTION POTENTIAL OF BALDWIN, ESCAMBIA AND MOBIL COUNTIES. *Mobile County Board of Health, Mobile, Ala., HUD Proj. Alabama P-63, 45p., April 1970. 17 refs.*

NTIS: PB 194 874

A preliminary study was made of the air pollution levels, causes, and their potential effects in Baldwin, Escambia, and Mobile Counties, Alabama. The study involved field sampling, a literature search, and analyses of previously accumulated data. Average particulate values for residential sites in all three counties were 48 to 63 micrograms/cu m. The range for all other sites in Baldwin and Escambia Counties was 38 to 73 micrograms/cu m. However, at two downtown sites and one industrial site in Mobile County, average values were 95 to 150 micrograms/cu m. Benzene soluble organics, dust fall, and sulfation rates also recorded a higher level in Mobile County. Gaseous pollutants do not appear to be a general problem in the area, although the possibility exists of higher levels in certain areas during limited time periods. Ventilation in the area and diffusion of pollutants is usually good, the exception being periods of low-leve inversion that exist approximately 35% of the time. Recommendation are made for a continuous monitoring program, a detailed emission inventory, zoning and planning, inspection of motor vehicle exhaust-control devices, and more stringent state laws concerning air pollution.

11595 APTIC NO. 28965

CARBON MONOXIDE CONCENTRATIONS IN NONURBAN ATMOSPHERES. (PROGRESS REPORT). *Stanford*

Research Inst., Menlo Park, Calif., 7p., Feb. 17, 1971. 1 ref.

As part of a study of the C(12)-C(13) isotope ratio of carbon monoxide, procedures were developed for collection and concentration of atmospheric CO. Procedures were also developed for sample purification and for the quantitative conversion of CO to CO_2 for isotope analysis by mass spectrometer. Sample air was first dried in a bed for anhydrous $CaSO_4$, then passed through a bed of lithium hydroxide, which reacts with CO_2 in the atmosphere to form lithium carbonate and water. Water produced by this chemical reaction was removed by a second bed of anhydrous $CaSO_4$, and sample air passed to a trap packed with granular silver bromide (AgBr) cooled to -182 C (liquid oxygen temperature). The cooled AgBr quantitatively removed CO and olefins continuously from either air or nitrogen. Gases released from the collection trap were purified by passing them through a tube submerged in liquid oxygen. The pure CO was oxidized to CO_2 and collected in a liquid nitrogen-cooled trap. Isotope ratios of 29 atmospheric samples and vehicle exhaust samples are given. It is expected that isotope ratios obtained by the method described will provide information on the role of the ocean as either a source or a sink for atmospheric CO.

11596 APTIC NO. 28979

Donovan, John L.

NEW YORK SHOWS GAINS IN SOOTFALL POLLUTION BATTLE. *Heating, Piping, Air Conditioning, 43(4):90-92, April 1971. 1 ref.*

Data are presented on average soot fall recorded for five Manhattan stations for the years 1944-1953 and also 1965-1969. The yearly averages are plotted to show the downward trend over this period. From 1965 through 1969, the average soot fall for the stations was 44.3 tons/sq mile/month, ranging from a low of 37.1 in 1969 to a high of 61.6 in 1965. Data for other boroughs of New York City for 1965-1969 show a similar trend. Although no clear correlation has been established, one factor in the decreased soot fall appears to be the conversion from coal and coke to fuel oil for domestic and industrial heating. Other factors are better enforcement of city ordinances and greater public awareness of the air pollution problem.

11597 APTIC NO. 29023

Lovelock, J. E.

ATMOSPHERIC FLUORINE COMPOUNDS AS INDICATORS OF AIR MOVEMENTS. *Nature (London), 230(5293):379, April 9, 1971. 2 refs.*

Preliminary measurements are reported for atmospheric concentration of sulfur hexafluoride and trichlorofluormethane and atmospheric turbidity in southwest Ireland during July and August 1970. The contaminants were measured with a gas chromatograph with an electron capture detector, the turbidity with a sun photometer. High concentrations of CCl_3F and SF_6 and appreciably increased turbidity are noted to be associated with easterly winds from continental Europe. These observations lend support to the proposal that CCl_3F and SF_6 can be used as indicators of air masses recently polluted by industrial pollutants.

11598 APTIC NO. 29029

Collins, A. C.

EMISSION OF SULPHUR DIOXIDE AND ATMOSPHERIC POLLUTION. *Chem. Engr. (London), no. 243:391-393, Nov. 1970. 26 refs.*

A comparison is made between quantities of sulfur dioxide from different sources and ground-level concentrations in Great Britain at two-yr intervals from 1952 through 1966. It is noted that large increases in emission due to fuel consumption for electricity generation and industrial processes have made a negligible contribution to SO_2 in air at breathing level. Thus, ground-level pollution in the main arises from low-level emissions, not from power station or industrial chimneys. The solution to the ground-level pollution is the desulfurization of fuels intended for small-scale uses. On the basis of the sulfur content of coal and fuel oil, SO_2 emissions in Britain in 1970 and 1975 will be 7.62 and 7.34 million tons, respectively.

11599 APTIC NO. 29040

Roenicke, G.

DESCRIPTION OF THE 'SCHAUINSLAND' STATION, GERMANY, AS AN EXAMPLE OF A PILOT STATION. *In: Research Facilities, Necessary to Adequately Support Measuremnt of Low Levels of Pollutants and Follow Their Trends. Organization for Economic Co-operation and Development, Paris (France), Chapt. 2, p. 9-28, Sept. 22, 1970.*

Plans are being made to create a world network of background and pollution measurement stations in which a regional or national network is associated with a central laboratory, called a pilot station. The Schauinsland pilot station is one of a network of seven supporting stations in West Germany. Its tasks are to coordinate the measurement methods, measuring equipment, and workin programs of the network; to calibrate measurement methods, to examine limitations of the methods in use, and to develop and test new measurement methods. To obtain samples in unpolluted air, the measurement and testing station is located in open countryside. Methods and instruments used for measuring dust fallout and concentrations of suspended matter, sulfur oxides, nitrogen dioxide, nitrous oxide, and fluorine compounds in the atmosphere are described. Other tasks undertaken include examination of condensation nuclei and recording of atmospheric electrical components. Biological materials, such as pollens and spores, are sampled continuously in a Burkard trap. Meteorological parameters are measured and recorded. Development work in progress includes an investigation of the use o a fluorine-specific electrode under low concentration conditions, automatic recording methods for measuring sulfur oxides and NO_2 concentrations, and testing of a calibration procedure which uses a gas mixing pump. The personnel of the station consists of a scientific director and five technicians. Equipment for research and development cost approximately $10,563, routine work equipment cost $51,098, and basic equipment for the laboratory, workshop, office and recreation rooms, office equipment, and miscellaneous items totalled $30,750. Operating costs for one year are estimated at $140,228.

11600 APTIC NO. 29051

Organization for Economic Co-operation and Development, Paris (France)

INTRODUCTION - PILOT STATIONS AND THEIR ASSOCIATION. *In: Research Facilities Necessary to Adequately Support Measurement of Low Levels of Pollutants and Follow Their Trends. Chapt. 1, p. 5-8, Sept. 22, 1970.*

The need for measurement of air pollution in the industrialized urban regions is generally accepted. Development of techniques for measuring atmospheric constituents such as sulfur compounds, carbon monoxide, and smoke revealed that some important pollutants, such as mercaptans, were causing a nuisance even at very low concentrations for which adequate measurement methods were not avilable. A few countries have already established research laboratories, known as pilot stations, to develop methods of measurement of low level concentrations of pollutants. In order to study the whole spectrum of pollution, sophisticated measurement techniques are required for which the accuracy and applicability of the methods must be established, and there is a need to compare measurement techniques. An association of pilot stations would be desirable for these purposes. Pilot stations will also provide the essential means for standardization and for monitoring the accuracy of simpler methods now in use. Pilot stations will be involved in developing instruments for automatic recording of concentrations of pollutants. By providing comparable results and exchanging data, the association of pilot stations will enable authorities to predict more accurately pollutant levels, which although now harmless, may be accumulating in the atmosphere to give undesirable concentrations. The association of pilot stations would be in a position to undertake problems which may be too complex for a single laboratory. Each laboratory in the association would follow its own research profile, but would cooperate for a particular aspects of the work.

11601 APTIC NO. 29052

Brosset, C.

ACTIVITIES AT A PILOT STATION IN SWEDEN. *In: Research Facilities Necessary to Adequately Support Measurement of Low Levels of Pollutants and Follow Their Trends. Organization for Economic Co-operation and Development, Paris (France), Chapt. 3, p. 29-31, Sept. 22, 1970.*

A Swedish air quality measurement station organized in 1967 is described. Only a minor part of funds received to date will be used for salaries, since most of the research work will be done by senior students at the Chalmers University of Technology. The department of inorganic chemistry at Chalmers and the Swedish Institute for Silicate Research will also supply personnel for the more complicated apparatus belonging to these institutions. The main part of the sampling will be done on Rao, a peninsula south of Goteborg. The building to be erected for the sampling apparatus will have a floor space of approximately 20 sq m. Instrumentation already in use is listed. The program includes reproduction of sampling methods used at a station in Schauinsland, Germany, as well as sampling of suspended matter on millipore filters, on Whatman paper, and by column adsorption. Continuous analyses with the same methods used in Schauinsland for sulfur dioxide and nitrogen oxides scanning are being routinely performed. Methods still under development include analyses by X-ray fluorescence, by electron microprobe analyzer, and desorption of hydrogen sulfide and organic sulfides from adsorption columns.

11602 APTIC NO. 29053

Avy, A. P.

POSSIBILITIES FOR A PILOT STATION IN FRANCE. *In: Research Facilities Necessary to Adequately Support Measurement of Low Levels of Pollutants and Follow Their Trends. Organization for Economic Co-operation and Development, Paris (France), Chapt. 4, p. 32-33, Sept. 22, 1970.*

France does not at present have a central or pilot station, that for the study comparison, and development of measurement methods for low-levels of pollution. Studies of analytical techniques and sampling methods for various substances are undertaken at laboratories monitoring urban and industrial pollution. These laboratories include university and local government laboratories and those of special research and meteorological institutes. The creation of a central laboratory, or pilot station, would provide air pollution measurement resources at less cost that the present diversified facilities and would permit advantageous site selection. No national program of research on measurement has yet been approved. The greatest research is on sampling methods and equipment to study particulate acidity. Studies on aerosol physics and chemistry (soluble, insoluble, and adsorbed gas phases) would also be undertaken. In the first stage of research work, it is suggested that priority be given to measurement methods for sulfur compounds (especially sulfur dioxide), nitrogen oxides, carbon dioxide, and aerosols.

11603 APTIC NO. 29106

Summers, Peter W.

SCAVENGING OF SO2 BY CONVECTIVE STORMS. *Atomic Energy Commission, Washington, D. C., Fallout Studies Branch and Battelle Memorial Inst., Richland, Wash., Pacific Northwest Lab., Precipitation Scavenging Proc. Symp., Richland, Wash., 1970, p. 305-318. 7 refs. (June 2-4.)*

During the summer of 1968, a meteorological research aircraft made 15 hr of airborne sulfur dioxide observations in central Alberta, Canada, with a continuous SO2 analyzer. On several occasions the aircraft measurements enabled estimates to be made of the air, moisture, and SO2 flux into the base of convective storms. Data presented here from one moderate and two severe convective storms indicate that such storms are very efficient in removing SO2 from the atmosphere. The estimated rainout efficiency lies in the range 0.19 to 0.65, and for severe storms the efficiency is probably near the upper limit. The common characteristic of severe convective storms is a strong updraft core causing localized high liquid water content. Thus, the air containing SO2 in the updraft is moving upward through this region of high water content in a way analogous to a gas scrubber in an effluent stack. The efficiency of this system is therefore much higher than for rainout from stratiform clouds. Although the liquid water content of the clouds was not measured directly, the results are consistent with the Junge formula for the rainout efficiency. (Author summary modified)

11604 APTIC NO. 29132

Nishida, Konosuke, Takashi Suzuka, Kazuhiko Mitsuoka, and Yoshinori Ishikawa

STUDIES ON SYNTHETIC EVALUATION ON ENVIRONMENTAL POLLUTION. REPORT 2: MUTUAL RELATION ON THE CONCENTRATION OF AIR POLLUTANTS. *(Kankyoosen no sogohyoka ni kansuru kenkyu. (Dai 2 ho) Taikiosen nodo no sogokankei ni tsuite). Text in Japanese. Nippon Eiseigaku Zasshi (Japan J. Hyg.), 26(1):148, April 1971. (Presented at the Japanese Society for Hygiene, Annual Meeting, 41st, Tokyo, Japan, April 3-4, 1971.)*

The mutual relationship between sulfur dioxide and floating dust, and their additive effect were studied. Similar variations of SO2 and floating dust with time were found and a mutual relationship was recognized between the two in terms of their daily average and peak concentrations. At one place in Osaka where the concentration of floating dust was high, the coefficient of correlation recorded as 0.76 in terms of daily average concentration and 0.74 in terms of daily peak level. The additive effect of SO2 and floating dust upon the human body was examined by applying the results of Ralph et al. in which the relationship between the excess deaths, SO2, and floating dust was established. Ralph et al. reported that it was not necessary to consider the effect when PS level (concentrations of SO2 (ppm) times concentrations of floating dust (micrograms/cu)) was below 50; however in Osaka, many districts' PS level exceeded 150 for 20 days or more in a year, so that the atmospheric environment of this region was classified as extremely poor.

11605 APTIC NO. 29152

Himi, Yasuji and F. Muramatsu

ANALYSIS OF HEAVY METALS IN ATMOSPHERIC SUSPENDED DUST (REPORT 1). DETERMINATION OF FE AND PB BY FLUORESCENT X-RAY ANALYSIS USING VACUUM-EVAPORATED STANDARDS. *(Fuyubaijinchu no jukinzoku no bunseki. Dai-1-po. Shinku jochaku hyojunskiryo o mochiita Fe, Pb no keiko X-sen bunseki). Text in Japanese. Taiki Osen Kenkyu (J. Japan Soc. Air Pollution), 5(1):58, 1970. (Proceedings of Japan Society of Air Pollution, Annual Meeting, 11th, 1970.)*

Fluorescent X-ray spectrometry was used to analyze heavy metals in the atmosphere. Samples of iron and lead in dusts were prepared by the vacuum evaporation method in which a uniform metallic film is formed on the filter. The filter used was a Gelman A type. Determination of Fe and Pb was accomplished by the o-phenanthroline and dithizone methods. The general technique was applied to suspended particultes in Kanagawa Prefecture, and calibration curves were drawn for Pb and Fe. Subsequent analysis by fluorescent X-ray spectrometry showed that the results corresponded very well to those obtained by chemical analysis.

11606 APTIC NO. 29153

Ishinishi, N. and Nobuyasu Shigemori

A SEASONAL VARIATION OF THE CONCENTRATION OF HEAVY METAL IN SUSPENDED DUST ON THE MAIN STREETS. *(Kosaten, fuyubaijinchu, jukinzokuryo no kisetsuteki hendo). Text in Japanese. Taiki Osen Kenkyu (J. Japan Soc. Air Pollution), 5(1):62, 1970. (Proceedings of Japan Society of Air Pollution, Annual Meeting, 11th, 1970.)*

Lead, iron, manganese, and cadmium in suspended dust collected at main traffic intersections in Kitakyushu and Fukuoka were analyzed. The dusts were collected by a high-volume air sampler and analyzed by atomic absorption spectrophotometry. Wavelength, lamp current, load voltage, hydrogen pressure, air pressure, and scale magnification data are listed for Pb, Fe, Mn, and Cd. The results indicate no special trends according to the season or the year. Iron concentrations, however, were the highest in Yawata District of Kitakyushu, an iron and steel production town.

11607 APTIC NO. 29156

Reed, L. E. and P. E. Trott

CONTINUOUS MEASUREMENT OF CARBON MONOXIDE IN STREETS 1967-1969. *Atmos. Environ., 5(1):27-39, Jan. 1971. 12 refs.*

Continuous measurements of carbon monoxide were made between September 1967 and March 1969 at Glasgow, Birmingham, Manchester, Enfield, Portsmouth, and Cardiff. All sites were in streets carrying a high volume of traffic and close to lights or crossings interfering with traffic flow. As determined by nondispersive gas analyzers, the proportion of time each month when 30 ppm CO was exceeded ranged from below 0.01-1.92%. Normally only a few minutes of this time were above 50 ppm; the maximum during one month at any sit was 70 min, and the longest single peak above 50 ppm lasted only 8 min. The highest peak concentration recorded was 114 ppm at Enfield. For each city, duration of CO concentrations above 10, 30, and 50 ppm are tabulated, as are frequency of peaks above 50 ppm and maximum recorded concentration. Data is also presented on diurnal and seasonal variations.

11608 APTIC NO. 29188

Kumazawa, Yasumasa and Yoshinori Nogami

FLUORESCENT X-RAY SPECTROMETRIC DETERMINATION OF HEAVY METALS IN AIR. *(Keiko X-ray bunsekiho ni yoru taiki chu jukinzoku no sokutei. III). Text in Japanese. Taiki Osen Kenkyu (J. Japan Soc. Air Pollution), 5(1):59, 1970. (Proceedings of the Japan Society of Air Pollution, Annual Meeting, 11th, 1970.)*

For the measurement of heavy metals in air, by the calibration line method spectrophotometric data and fluorescent X-ray intensities were compared to obtain the calibration line. In the standard additive method, a certain amount of a standard chelate compound is added to the filter, and dusts collected on the filter are analyzed by fluorescent X-ray analysis. The effect of elution due to the solvent agent could thus be suppressed. By means of the above method, atmospheric zinc concentrations were determined at three locations in Osaka. The results are tabulated. It is noted that Gelman Type A filter was not used because the background noise due to zinc is too high. Tokyo Filter Paper CO's GB-100 type filter was used instead.

11609 APTIC NO. 29191

Watanabe, Hiroshi, H. Mitsuki,, T. Koyama, Yoshihiro Nakagawa, and N. Takada

ON THE METALLIC COMPONENTS IN SUSPENDED PARTICULATE AND ITS LOCAL CHARACTERISTICS. *(Fuyu biryushichu no knzoku sibun to chiiki tokusei). Text in Japanese. Taiki Osen Kenkyu (J. Japan Soc. Air Pollution), 5(1):60, 1970. (Proceedings of the Japan Society of Air Pollution, Annual Meeting, 11th, 1970.)*

Dusts, iron, lead, copper, cadmium, vanadium, zinc, and manganese were measured in the neighborhood of an iron works and other plants. High-volume air samplers, low-volume air samplers, and cascade centripeters werw used for sampling. Dusts were measured by gravimetry and metals by atomic absorption spectrophotometry. In the area of the iron-producing plant, 80% of Pb, V, and Cd, but only 44% of Fe existed as fine particulates in air. Almost 100% of Cd was under 0.7 micron; over 90% of Pb was under 2 micron; and over 80% of Fe, Mn, and Cu was under 7 micron. Comparison of the amount of metallic content of the dusts collected in two areas by a high-volume sampler with a cyclone showed that the proportion of Fe is higher in the neighborhood of the iron-producing plant.

11610 APTIC NO. 29229

Fukuoka Prefectural Government (Japan), Public Nuisance Section

ON QUANTITY OF 3,4-BENZPYRENE CONTAINED IN PRECIPITATING IN KITA-KYUSHU INDUSTRIAL ZONE, 7TH REPORT. *(Kita-kyushu no kokajin chu 3,4-Benzpyrene ryo ni tsuite, Dai 7-ho). Text in Japanese. In:*

Air Pollution in Fukuoka Prefecture. Rept. 9, p. 139-146, Sept. 1969.

Precipitating dust was sampled during a one-year period from Nov. 1966 to Oct. 1967 in Kitakyushu City, Kyushu, Japan. The insoluble content of the precipitating dust was quantitatively determined and then analyzed for tar and 3,4-benzpyrene content. The insoluble content amounted to 10.64 (ton/sq m) for monthly average in the industrial zone of the city and 8.53 in the commercial zone of the city. For Omuta City, neighboring Kitakyushu City, it was 12.46 while it was 7.59 in Fukuoka City, another neighboring city which is primarily a commercial town. No seasonal trend was noticeable in Kitakyushu while some seasonal variation was noted for Omuta and Fukuoka. The total quantity of insoluble substances collected from the sampled dust was used for the 3,4-Bp analysis. The monthly average value of the tar content was 5.8 mg per 1 g of the insoluble content analyzed for the industrial zone of Kitakyushu while it was 7.5 mg for the commercial zone. It was 7.5 mg for Fukuoka, indicating a higher value than the industrial zone of Kitakyushu. The figure was 21.9 mg for Omuta, where chemical industry is the main industrial activity. The monthly average of 3,4-Bp was 43.4 micrograms/sq m for the industrial zone of Kitakyushu and 7.1 sq/m for the commercial zone, the latter being a sixth of the former. The figure was 13.9 micrograms/sq cm for Omuta or a quarter of the value for the industrial zone of Kitakyushu. For Kitakyushu, the 3,4-Bp quantity was higher in the industrial zone than in the commercial zone when determined on basis of the results obtained in the past 7 years. The quantity for the industrial zone increased slightly from the corresponding figure for the preceding year but decreased as compared with the year before the preceding year. In Fukuoka, a primarily commercial city, the monthly average was less than 1 microgram/sq m for most months of the year, although quantity of the precipitating dust was about the same with that for the commercial zone of Kitakyushu. Fukuoka also indicated some seasonal increase in winter. In all cities alike, the 3,4-Bp quantity was higher in winter, indicating a close relationship with smog formation and winter heating.

11611 APTIC NO. 29250

Odaira, Toshio, Saburo Fukuoka, Mitsuru Udagawa, and Masahi Ito

THE ACTUAL STATE OF WEATHER SURVEY FROM AIR POLLUTION IN TOKYO. *(Tokyo-to ni okeru kogai kisho no kansoku gyomu no genkyo). Text in Japanese. Kogai to Taisaku (J. Pollution Control), 7(3):233-240, March 1971. 7 refs.*

The activities of air pollutants in the atmosphere such as diffusion, dilution, removal, residence and qualitative change depend on meteorological conditions such as wind direction, wind velocity, atmospheric stability, insolation, and rainfall. Observations of wind direction, wind velocity and atmospheric stability were conducted. At the Tokyo Tower, wind direction and velocity are measured at 3 different altitudes (25m, 107m, and 250m) and the temperature at 6 different altitudes (2m, 64m, 103m, 169, 221m, and 250m) while at the NHK Tower, the direction and velocity are measured at 2 different altitudes (5m and 180m) and the temperature at 6 altitudes (5m, 45m, 90m, 135m, 225, and 313m). In addition, a horizontal observation network consisting of 10 observation stations was set up to measure wind direction, wind velocity, temperature, humidity, ultraviolet rays, and visible rays. The data are automatically fed into a central system by telemetry and teletyped every 15 minutes. The monitoring system is also used to receive computerized meteorological information. The air pollution prediction system developed from the meteorological studies of the Tokyo s air pollution is now underway. Under the system, sulfur dioxide density and photochemical smog are predicted for daily and for the following day. When predicting the SO2 density for next day, high SO2 density prediction is indicated if moving high pressure prevails over the Kanto District; the Kanto District is situated behind the high pressure zone; the distribution of atmospheric pressure is higher to the west and lower to the east with a low pressure area over the Sea of Japan; and the atmospheric pressure distribution is higher to the south and lower to the north with a south wind.

11612 APTIC NO. 29280

Rondia, D. and J. J. Van Lochem

FIVE YEARS OF DAILY MEASUREMENTS OF AI POLLUTION BY SO2 IN LIEGE. *(Cinq annees de mesures journalieres de la pollution de0 l air par SO2 a Liege). Text in French. Rev. Univer. Mines, Metall., Trav. Public, Sci Arts Appl. Ind. (Liege), 113(1): 23-28, March 15, 1970. 6 refs.*

During the period 1960-1965, daily analyses of the sulfur dioxide content in the air over Liege Belgium, were conducted at a representative site. The paper filters with the retained particles from a point 7 m above street level were then processed for spectrophotometric evaluation. The results of these analyses, with the concentration of sulfurous anhydride (SO2) were fed into a computer for processing into monthly and other statistics which, upon further study, would permit interpretations as to the regular and incidental causes of the fluctuations in SO2 levels. The monthly statistics showed concentrations to be highest in December, January, and February, when the average for the 5-year period was 240 micrograms per cu m, compared with 80 m in June, July, and August. This is ascribed to the absence of domestic heating in the summer months. A comparison between conditions on workdays and weekends respectively shows a 5-year average for January and February of 250 and 192 micrograms/cu m respectively, and for June and July of 92 and 69 micrograms/cu m respectively. The difference between workday and weekend values indicates the contribution of industry to the pollution problem.

11613 APTIC NO. 29287

Bouquiaux, J. and J. Grandjean

AIR POLLUTION BY SMOKE AND SO2. *(Pollution atmospherique. Fumee et SO2). Text in French. Bull. Mens. Inst. Royal Meteorol. Belgique, 28p., Jan. 1970.*

The measured values of smoke and sulfur dioxide respectively, are expressed in micrograms per cubic meter of air, as well as the ratio figures of smoke to SO2, for every day of the month. The readings are grouped by districts, and listed for each individual point of air sampling. Separate diagrams show smoke and SO2 figures as well as monthly average, maximum and minimum readings for the districts of Brussels, Liege, Charleroi, Gent, and Antwerp. As an example of actual figures shown for January 1970, smoke in the Brussels district averaged 67 micrograms per cu m of air, with a maximum reading of 204 and a minimum of 6. During the same period, Liege had 47 average, 119 maximum, and 2 minimum. The figures for SO2 were: Brussels, 281 micrograms average, 1039 maximum, 2 minimum; Liege, 170 average, 670 maximum, zero minimum. There is a total of 230 stations in Belgium, each of which is equipped for continuous air monitoring including a diagphragm type pump which sucks in about 2 cu m air per 24 hours. Whatman no. 1 paper filters for retention of

SO2, gas absorbing water bottles, and a gas meter. Once a week each station sends 7 sets of filters and bottles to one of the five laboratories for analysis. Daily average values of SO2 and smoke concentrations are determined and then transmitted to the Central Data Processing Station of the Royal Meteorological Institute.

11614 APTIC NO. 29288

Bouquiaux, J. and J. Grandjean

AIR POLLUTION BY SMOKE AND SO2. *(Pollution atmospherique. Fumee et SO2). Text in French. Bull. Mens Inst. Royal Meteorol. Belgique, 28p., Feb. 1970.*

The measured values of smoke and sulfur dioxide respectively, are expressed in micrograms per cubic meter of air, as well as the ratio figures of smoke to SO2, for every day of the month. The readings are grouped by districts, and listed for each individual point of air sampling. Separate diagrams show smoke and SO2 figures as well as monthly average, maximum, and minimum readings for the districts of Brussels, Liege, Charleroi, Gent, and Antwerp. As an example of actual figures shown for February 1970, smoke in the Brussels district averaged 52 micrograms per cu m of air, with a maximum reading of 262 and a minimum of 8. During the same period, Liege had 34 average, 150 maximum, and 2 minimum. The figures for SO2 were: Brussels, 225 micrograms average, 1339 maximum, 14 minimum; Liege, 158 average, 849 maximum, 13 minimum. There is a total of 230 stations in Belgium, each of which is equipped for continuous air monitoring including a diaphragm type pump which sucks in about 2 cu m air per 24 hours. Whatman no. 1 paper filters for retention of SO2 gas absorbing water bottles and a gas meter. Once a week each station sends 7 sets of filters and bottles to one of the five laboratories for analysis. Daily average values of SO2 and smoke concentrations are determined and then transmitted to the Central Data Processing Station of the Royal Meteorological Institute.

11615 APTIC NO. 29293

Vermande, P.

THE ABSORPTION SPECTRUM OF THE TERRESTRIAL ATMOSPHERE WITH A HIGH RESOLUTION BETWEEN 1159 AND 1172/CM. *(Spectre d absorption de l atmosphere terrestre a haute resolution de 1159 a 1172/cm). Text in French. Ann. Geophys., 26(1):65-69, Jan.-Feb.-March 1970. 3 refs.*

The absorption spectrum of the terrestrial atmosphere, with the sun as a source, between 1159 and 1172/cm, was obtained with a grid spectrometer equipped with rotating grids. This spectral interval was selected to obtain some lines of the spectrum of formaldehyde (CH20). The comparison with the spectra of ozone, nitrous oxide, methane, and CH20, obtained in the laboratory with the same dispersion, allows all the lines to be identified, except for six which remain in doubt.

11616 APTIC NO. 29310

Tokyo Metropolitan Environmental Pollution Research Inst. (Japan)

RESULT OF CO SURVEYS MADE AT INTERSECTIONS, 1970. *(Showa 45-nendo, Kosaten issanka tanso chosa kekka). Text in Japanese. 109p., March 1971.*

Detailed measurements of carbon monoxide, wind direction, and wind velocity obtained during surveys conducted from June to Sept. 1970 at 9 busy intersections are presented. Carbon monoxide figures are given in hourly averages; wind direction and velocity are the average of 10 minutes before the hour for 10 minutes, taken at the intersection, 100 m from it, and in the hinterland. Special surveys were made of a building (2nd and 6th floors) a conference room before and after a conference, dining hall, and from another building. The diffusion effect of fences was also investigated at an intersection on Tokyo-Chiba highway.

11617 APTIC NO. 29315

Cooke, N. E.

AIR SURVEYS LINKED WITH MATHEMATICAL MODEL TO PROTECT ENVIRONMENT. *Water Pollution Control (Toronto), 109(5):59-61, May 1971. 4 refs.*

Data from long-term air measurements were used to develop atmospheric dispersion equations describing ground-level concentrations of fluorides from the gypsum ponds and the diammonium phosphate stack of fertilizer complex and fluoride plus sulfur dioxide concentrations from a neighboring power plant stack. With the equations it was possible to simulate mathematically any combination of circumstances affecting the fertilizer plant emissions and to determine appropriate pollution control measures. On the basis of the study, it was decided to install a venturi scrubber in the diammonium phosphate stack and to create a buffer zone around the gypsum plant.

11618 APTIC NO. 29341

AIR POLLUTION MONITORING IN THE RHINE ESTUARY AT ROTTERDAM. *(Ueberwachung der Luftverunreinigung im Rheinmuendungsgebiet bei Rotterdam). Text in German. Elektrizitaetswirtschaft, 70(5): 123-124, 1971.*

In the Rhine estuary in the Netherlands, 31 air monitors measure the atmospheric sulfur dioxide content at one-minute intervals and transmit their data electronically to a computer in the air pollution control center in Schiedam. From the available data, the computer determines 64 times per hour the 31 hourly averages of the SO2 content. By comparison with the data obtained on the previous day, the trend of changes of the SO2 level is found. The air samplers operate on a colorimetric principle. The 31 air monitors were set up with the aid of a mathematical model. Through the operation of this air monitoring system, pollution by sulfur compounds can be reduced in this area although production has doubled.

11619 APTIC NO. 29349

Nakayama, Hidero

REPORT OF THE INVESTIGATIONS ON THE OFFENSIVE ODOR IN YOKKAICHI CITY. *(Yokkaichi chiku ni okeru akushu ni kansuru chosa hokokusho). Text in Japanese. 122p., 1969.*

Offensive odors in Yokkaichi City, Mie Prefecture were analyzed. The concentration was estimated and gas chromatographic qualitative and quantitative determinations were made. The selection of column, conditions of gas chromatography, drawing up of a calibration curve, and the method of elimination were mentioned. On-the-spot investigations were carried out in the district around the petroleum industries in the town and the site of frequent complaints from March 1969 to March 1970. Although the charts had not yet determined some patterns, they showed that hydrocarbons were frequently found because of the petroleum industry s use of substances with relatively low boiling points. Furthermore, the sulfur compounds such as hydrogen sulfide, carbon disulfide and methyl mercaptan were detected in some districts and aldehydes such acetaldehyde and n-butyraldehyde at other districts. Hydrocarbons include many olefins. Also, the relationship between the contamination by organic matters and the amount of hydrogen sulfide and total aldehyde was observed; 0.026 ppm H2S was detected at one point and aldehydes were found at every point, with a minimal value of 0.003 ppm and a maximum of 0.022 ppm. This result agreed with the result from gas chromatography. The amount of bad-smelling substances such as mercaptan and sulfinel could not be determined when they coexisted with a great deal of hydrocarbons and other substances.

11620 APTIC NO. 29358

Sawaya, Tsuguo

THE PUBLIC NUISANCE OF AIR POLLUTION. *(Taiki osen kogai ni tsuite) Text in Japanese. Nippon Kogyo Kaishi (J. Mining Met. Inst. Japan) 87(996):149-160, March 1971.*

Before the second World War, the clouds of smoke emitted from chimneys were received as evidence of industrial productivity. Since about 1955, Japanese economy showed signs of reconstruction, and since 1962, Japanese industries have developed so tremendously that now the gross national product is ranked second or third in th world. With the advance of industry, the traffic and public nuisance problems have increased. In 1962, people were not concerned about the public nuisances, and Minamata disease was considered as a special accident in a unique area. But afterwards, in various places in the country, analogous diseases broke out, for instance, Yokohama asthma, Yokkaichi asthma, the Minamata disease on the River Agano, and the Itai-itai disease. Recently the public, the government, and the industries have become concerned with these public nuisance problems, and improvements are expected in the social deformation. An outline describes the determination methods of air pollutants (gases; dusts), the present air pollution situation in Japan (suspended and falling dust; sulfur dioxide; automotive exhaust gas; and other harmful gases), t desirable air content (environmental standards for sulfur dioxide, other gases, and dusts; standards for labor environment), and the prevention policy for air pollution in laws and ordinances (effluen standards for stack gases and dusts; ordinance regulations for air pollutant emission; an example sulfur oxides - with the equations for the regulation of pollutant, the estimation of efficient stack height, the estimation of pollutant landing concentration, and the effect of measuring time). Graphs and tables are cited for reference.

11621 APTIC NO. 29382

Hishida, Kazuo

PRESENT STATE AND CONTROL OF POLLUTION BY SMOKE. *(Nensho kogai no genjo to kogai boshi taisaku). Text in Japanese. Nippon Kikai Gakkai-Shi (J. Japan Soc. Mech. Engrs. Tokyo), 74(626): 215-216, March 1971. 11 refs.*

Pollution from combustion is principally air pollution. It is considered in two forms, wide area and local. Sources of wide area pollution are sulfur oxides and automotive exhausts. These are also causes of smog, local contamination stems from particulates, metallic and carbonaceous. Sulfur oxide concentrations and distribution have both increased significantly since 1965. The National Standard for SO2 is less than 0.05 ppm/hr urban and industrial areas exceeding this limit are shown. Sulfur trioxide was identified as a source of acid-smut, however, recently sulfuric acid mist has replaced it in the public notice. Ring contamination by sulfuric acid mist was observed at Suginami, Tokyo in 1970 where it averaged 20 micrograms/cu m. for 24 hrs. Suspended particulates measured 461 micrograms/cu m. Sulfate in the dust was 95 microgram/cu m (20%). The catalytic effect of metallic particulates is considerd a cause of the formation of SO3 which reacts with water vapor to form sulfuric acid mist. Heavy metal particulates are common in industrial areas. Automotive exhaust pollution is a salient feature of todays large cities and it is increasing. The provisional standard for airborne load (5 microgram/cu m/day is exceeded at 7 stations. Lead contamination is reported to agree with carbon monoxide concentration. Nitrogen oxides and hydrocarbons data are sparce, but these compounds are chiefly responsible for photochemical smog. Oxidants concentration is a function of the hydrocarbon/nitrogen oxides ratio, hydrocarbon activity, and weather conditions. Local contamination by smoke and other particulates is decreaseing with the expanded use of dust collecting equipment.

11622 APTIC NO. 29385

Kiyoura, Raisaku, Yoshisuke Uenishi, Milton Munisada, Masaya Iguchi, Toru Kuramoto, Gunji Kawasaki, and Naotake Naito

INTERRELATIONSHIP OF HEAVY METALS SUCH AS LEAD IN SO2, NO2 AND FLOATING DUST IN THE URBAN ATMOSPHERE. *(Toshi taiki chu no SO2, NO2, fuyu funjin chu no Pb to jukinzoku sogo no kankei). Text in Japanese. Preprint, Japan Chemical Society, Tokyo, 1p., 1971. (Presented at the Japan Chemical Society Annual Meeting, Tokyo, March 1971, Paper 3346.)*

Measurements of heavy metals such as lead in suspended dust and0 of sulfur dioxide in nitrogen dioxide, and inorganics, are reported. Suspended dust was measured using a high volume sampler; heavy metals in dust were analyzed by atomic light absorption, and inorganics by conventional wet-type techniques. NO2 was measured by the Saltzman method and SO2 by electroconductivity analyzer and P-rosaniline method. The average for NO2 in October was about 0.025 ppm, lower than the 0.035 ppm for SO2. The average suspended dust was 210 micrograms/cu m. There was a consistency in the change of concentrations of NO2 and SO2. The concentration of suspended dust also had a high correlation with NO2 and SO2. If the pollution from NO and NO2 from suspended dust and automobile exhaust gas is the basis of urban air pollution, the pollutants from the surrounding industrial areas would be added to this base to further increase urban pollution levels. There is very high correlation between Pb in dust and the water-soluble NO3 ion, the higher the traffic load, the higher the concentration of Pb and NO3 in the dust. Therefore, these are considered to be the indicators of pollution from automobile exhaust. Such heavy metals as manganese in dust are presumed to play the role of catalysts in the oxidation reaction of SO2 and NO.

11623 APTIC NO. 29389

Kuroe, Toshiharu and Osamu Tada

AIR POLLUTION IN ROAD TUNNELS. *(Doro tonnerunai no kukiosen ni tsuite). Text in Japanese. Japan Industrial Medical Society, Proc. Japan Ind. Med. Soc., Meet., 44th, Tokyo, Japan, 1971, p. 152-153. (April 3-4.)*

The level of air pollution (concentrations of carbon monoxide, nitrogen dioxide, and dust) caused by auto exhaust gases inside 19 road tunnels (465-2953 m long) were investigated with special reference to its relationship to the location in the tunnels and to traffic conditions. A close correlation was noticed between traffic conditions and levels of air pollution. In tunnels where traffic conditions exceeded 1000 cars per hour, the

CO concentration and the amount of dust were found to increase almost directly with an increase in the amount of traffic. It was throught that the most conspicously polluted area in tunnels was the center. In highly polluted tunnels, the CO concentration reached peaks of about 215 ppm; the highest average concentration for 20 minutes was 85 ppm.

11624 APTIC NO. 29390

Kiyoura, Raisaku, Yoshisuke Uenishi, Milton Munidasa, Masaya Iguchi, Toru Kuramoto, Gunji Kawasaki, and Naotake Naito

DUST POLLUTION IN A WIDE URBAN AREA. *(Daitoshi ni okeru koiki fuyu funjin osen). Text in Japanese. Preprint, Japan Chemical Society, Tokyo, 1p., 1971. (Presented at the Japan Chemical Society, Annual Meeting, 24th, Tokyo, March 1971, Paper 3342.)*

Measurements of suspended dust, made since 1969 in the Tokyo- Yokohama and Amagasaki-West Osaka industrial areas by using high volume air samplers, and a cascade centripeter are reported. Water soluble ions were analyzed by conventional wet methods and heavy metals by atomic light absorption. It was confirmed that the residential suburbs of Tokyo are polluted over wide areas from the suspended dust and gas pollutants emitted from Tokyo-Yokohama industrial area, on top of the urban pollution base. Pollution is attributed to the increase of high chimney stacks, constructed for the prevention of air pollution, and the amount of smoke emitted. The Meguro and Suninami wards oof Tokyo and 3 spots in Amagasaki City were compared by simultaneous and continuous measurement. The average dust concentration for October was 210 microgram/cu m in Meguro, 200 micrograms/cu m in Suginami, and 194 micrograms/cu m in Amagasaki City.

11625 APTIC NO. 29411

Nakano, Michio

OUTLINE OF AIR POLLUTION IN OSAKA. *(Osaka no taiki osen no gaikyo). Text in Japanese. Kankyo Eisei (Environmental Sanitation), p. 41-54, 1970 (?). 7 refs.*

There are 28,000 industrial enterprises with 550,000 employees in Osaka; the three main categories are chemical, iron and steel, and machine manufacturing plants. Consumption of coal is down from 1961, the peak year, while heavy oil consumption is 5 times higher than in 1958 level, and use of C-degree heavy oil, with a high sulfur content has increased 8 times. The amount of dust measured at 11 monitoring sites is down from 1961, but not for sulfur oxides. Because it lies in a topographic basin, smog of very high humidity is common. In Taisho Ward, where there is a cement factory, the average monthly dust measurement for 1967 was 35.26 tons/sq km, the highest in the city. Sulfur dioxide measured by lead peroxide method reached a peak in 1964, and decreased considerably in 1965, then slightly increased. Since 1967, monitoring sites have increased to 101. The number of smog days have declined from a 1950 peak of 163 days. About 17.0% of the industries feel that they are responsible for pollution; the rest feel they are not. The incidence of chronic bronchitis is higher as people get older, if they smoke and as air pollution increases.

11626 APTIC NO. 29416

Hishida, Kazuo

ON ACTUAL CONDITION OF AIR POLLUTION -CENTERING AROUND CASE OF TOKYO. *(Taikiosen no genjo ni tsuite - Tokyo-to no baai o chushin to shite). Text in Japanese. Japan Society of Mechanical Engineering, Tokyo Proc. Special Symp. Air Pollution, 27th 1971, p. 1-22. 31 refs. (April.)*

In 1964, air pollution by sulfur oxides was a local problem confined to some specific regions, but today it has become a common national problem. In Tokyo (except its suburban area), the density of sulfur dioxide and trioxide was a record high of 0.054 ppm in 1967 and has since lowered to a record of 0.045 ppm in 1970. With 1964 taken as 100 when the entire metropolitan district showed an average of 0.038 ppm and the legal criteria was 0.05 ppm, it was 134 for 1965; 137 for 1966; 142 for 1967; 137 for 1968; 137 for 1969; and 118 for 1970. In the current winter (December 1970 through March 1971), the smog alarm was issued only three times compared with seven times in the preceding winter and 16 times in winter before that. The legal control measures set forth to curb the air pollution caused by sulfur oxides were inadequate for Tokyo. The effective chimney height and other specified criteria in the regulations cannot reduce pollution unless the total emission of SO2, and SO3 is reduced. In fact, of Tokyo s 10,500 installations surveyed, only 79 failed to meet the legal criteria, and their total sulfur oxide emission was estimated to account for only 0.8% of the Toky-wide total. Carbon monoxide density of automatic emissions was studied at a number of intersections in Tokyo in relation to quantity of traffic and hours of day. The mechanism of photochemical smog and oxidant was also discussed. A lead carbon monoxide correlation diagram was analyzed covering the period from May 26, 1970 to June 3, 1970 for Yanagi-cho, Shinjuku, Tokyo, where the accident involving lead air pollution occurred. Settled and suspended dust and soot were discussed with statistics showing its trend for several years past. Measures were urged to cope with hydrogen chloride (hydrochloric acid) gas generated by incineration of plastics. Other noxious gases were discussed such as ammonia, hydrogen sulfide, and hydrochloric acid.

11627 APTIC NO. 29458

Tokyo Metropolitan Environmental Pollutions Research Inst. (Japan), Atmosphere Dept.

ON DAILY VARIATION AND FREQUENCY DISTRIBUTION OF CO, NO, AND NO2 CONCENTRATIONS IN TOKYO. *(Tokyo tonai CO, NO, NO2, nodo no nichi kenka oyobi hindo bunpu ni tsuite). Text in Japanese. 193p., Feb. 1971.*

Seasonal daily change patterns and the frequency distribution of hourly concentrations of nitric oxide, nitrogen dioxide and carbon monoxide were plotted by logarithmic probability, and the concentration distribution range of 16%, 50%, and 84% are shown for 1966 to Feb. 1970. Daily change graphs were based upon the data collected at atmospheric monitoring stations. In front of the Metropolitan Government Office the peak of CO is reached around 4 pm or between 4 and 8 pm. Two peaks in NO are observed in the daily change graphs, one between 8 am and noon and the other, between 4 and 8 pm.

ATMOSPHERIC INTERACTION

11628 APTIC NO. 27263

Newell, Reginald E.

MODIFICATION OF STRATOSPHERIC PROPERTIES BY TRACE CONSTITUENT CHANGES. *Nature (London), 227(5259):697-699, Aug. 15, 1970. 15 refs.*

The stratospheric temperature seems to increase by about 5 C, and it remains higher than normal for several years when large changes in trace constituent concentrations occur naturally as, for example, after a volcanic eruption. Temperature deviations are indicated following a major eruption of Mt. Agung on March 17, 1963. The deviation pattern exhibits a maximum a low latitudes in the lower stratosphere and slopes downwards towards the pole, in some cases at a slope greater than that of the potential temperature surfaces. Volcanic gases contain large quantities of water vapor, carbon dioxide, and sulfur dioxide; aircraft sampling has indicated that the volcanic dust is coated with sulfuric acid. Measurements of solar radiation at the surface and scattered light from twilight have been used to trace the cloud from Mt. Agung, Bali.

11629 APTIC NO. 27281

Fischer, William H.

ATMOSPHERIC AEROSOL BACKGROUND LEVEL. *Science, 171(3973):828-829, Feb. 26, 1971. 2 refs.*

When a scattering component of the extinction coefficient of air is compared to the component due to air with no aerosol, the atmospheric aerosol load appears to be increasing. From atmospheric turbidity measurements made with a Volz sunphotometer at McMurdo Station, Antarctica, the November-December 1966 value of this ratio is 1.36. The value for Mount Olympus, Washington, in February-March 1968 is 1.5 and 1.95 for Point Barrow, Alaska, in March 1970. However, Porch et al discard the hypothesis that the increase from 1968 to 1970 may represent the cumulative effect of 2 years of aerosol production in favor of one invoking an altitude between the last two stations. From turbidity measurements of his own, the present author indicates that the differences are indeed due to the increase of atmospheric aerosols with time.

11630 APTIC NO. 27283

Hodge, Paul W.

LARGE DECREASE IN THE CLEAN AIR TRANSMISSION OF THE ATMOSPHERE 1.7 KM ABOVE LOS ANGELES. *Nature (London), 229(5286):549, Feb. 19, 1971. 6 refs.*

Astronomical measures of atmospheric extinction, routinely carried out during most programs of astronomical photoelectric photometry, provide a large sample of data of importance to studies of long term anthropogenic pollution of the atmosphere. A large secular decrease in the transmission of the atmosphere measured at 1.7 km above the Los Angeles Basin is noted. Atmospheric extinction was measured in three wavelengths on 31 clear, smogless nights, in the years just before the advent of frequent occurrences of smog at this altitude. The mean extinction coefficients for this data from the 60s were compared with values published in 1911. Differences in the extinction coefficients are striking: 0.27 magnitude in the ultraviolet, 0.09 mag in the blue, and 0.010 mag in the yellow.

11631 APTIC NO. 27351

Robbins, John A.

A MODEL FOR VARIATIONS OF HALOGEN ION RATIOS IN MARINE AEROSOLS WITH PARTICLE SIZE. *Preprint, 44p., May 1970. 27 refs. (Presente at the Precipitation Scavenging Meeting, Richland, Wash., June 2-4, 1970.)*

A mathematical model was formulated to account for published chemical analyses of marine aerosol-size fractions for iodine, bromine, and chlorine. The model assumes that iodine vapor is gained and bromine vapor lost by particles at rates determined by gaseous diffusion around the particle. Both iodine and bromine may saturate a particle surface layer, although the detailed mechanisms of saturation is not crucial to the model. By nonlinear least squares fitting to observed data points, the model satisfactory accounts for a decrease in I/Cl with increased radius for larger unsaturated particles and for smaller saturated particles; the former show an inverse dependence on wind speed. The model accounts for the observed minimum in Br/Cl for intermediate size fractions and the inverse dependence of its depth on wind speed. To account for the observed composition variation with size fraction, the model assumes that most of the aerosol mass samples is derived from a fairly narrow band of particle ages. This assumption provides an explanation for dependence on wind speed. Among the specific questions raised in this study are the band width of aerosol particles ages with wind speed and sampling location, the chemistry of iodine and bromine retention by particles, and the mechanism of bromine loss from particles. (Author abstract modified)

11632 APTIC NO. 27378

Dopplick, Thomas Gilbert

GLOBAL RADIATIVE HEATING OF THE EARTH'S ATMOSPHERE. *Massachusetts Inst. of Tech., Cambridge, Dept. of Meteorology, AEC Contract AT(30-1)2241, Rept. 24, MIT-2241-58, 128p., April 15, 1970. 45 refs.*

Data on monthly zonal mean global radiative heating rates from the surface to 10 mb for all months of the year from latitude 85 N to 80 S are presented and the spectral properties and sources are give for the global radiative parameters: water vapor, carbon dioxide, ozone, molecular oxygen, temperature, clouds, diffuse radiation, magnification factor, surface albedo, earth-sun distance, and solar scattering from clouds and the ground. Seasonal profiles of the contribution by each constituent are presented in addition to seasonal profiles of net thermal cooling and total radiative heating. Radiation cools the troposphere almost everywhere primarily due to water vapor, and radiative cooling is maximum in the tropics. The tropical stratosphere is heated by radiation due principally to thermal and solar heating by ozone. This radiative heating extends into the stratospheric mid-latitudes but higher latitudes exhibit cooling due primarily to thermal cooling by CO2 with the warmer hemisphere showing more cooling. Comparison with previous theory in the Northern Hemisphere shows qualitative agreement, although the present study has more resolution because of the better specification of the radiative parameters, in particular, ozone and temperature. Comparison of the energy available to the earth-atmosphere system between theory and satellite measurements shows that theory overestimates the amount of energy available, probably because of the use of mean optical properties of clouds and the ground. (Author abstract modified)

11633 APTIC NO. 27464

Yanagihara, Shigeru

PHOTOCHEMICAL REACTION OF AUTO EXHAUST. *(Jidosha haiki gasu no kokagaku hanno ni tsuite). Text in Japanese. Bunseki Kagaku (Japan Analyst) (Tokyo), 20(1):129, Jan. 1971. (Presented at the Round-Table Conference on Air Pollution, 60th, Tokyo, Japan, Oct. 28, 1970.)*

Results are reported for smog chamber experiments involving the irradiation of ethylene and nitric oxide. In addition to the irradiation chamber and light source, the smog chamber system comprised a chassis dynamometer, an exhaust gas separator, an apparatus for diluting air, and a gas analyzer. Nitrogen dioxide began forming immediately upon the irradiation of a mixture of 2 ppm ethylene and 0.5 ppm nitric oxide. The concentration reached 0.5 ppm after three hours, then subsequently decreased. Oxidant concentrations reached 0.1

ppm after three hours and then increased at a relatively sharp rate to 0.25 ppm. Nitric oxide almost completely disappeared four hours after irradiation, but six to eight hours were required for nitrogen oxide to decrease. In general, oxidant values were higher when ethylene concentration was high and nitric oxide concentration low.

11634 APTIC NO. 27492

Kogo, Tetsutaro, Ryosaku Endo, and Tatsunori Oyake

A STUDY ON THE RELATIONSHIP BETWEEN AIR POLLUTION AND ATMOSPHERIC CONDITIONS (1ST REPORT): IN TERMS OF SO_2, NO_2, NO AND AIR BORNE DUST IN SAPPORO CITY IN WINTER. *(Taikiosenshitsu no sokankankei ni kansuru kenkyu. (Dai 1 po) Fuyu no Sapporo-shi no okeru SO_2, NO_2, NO oyobi fuyufunjin no kankei ni tsuite). Text in Japanese. Nippon Koshu Eisei Zasshi (Japan J. Public Health), 17(12) Special Issue: 1004, Oct. 1970 (Proceedings of the 28th Annual Meeting of the Japanese Society of Public Health.)*

As a result of the measurement carried out at Sapporo National Air Pollution Sampling Station, the mutual relationship between atmospheric conditions and the various kinds of pollution and their pollutants was discussed. The level of each pollutant in the air increased when the wind direction was SE and the velocity was below 1.9 m/s. The associations of each pollutant with temperature and humidity were not so remarkable as with wind direction and velocity. The mutual relations between each pollutant obtained from the results of measurement from December through February and its estimation as a function of time were as follows: relationship between NO and air borne dust was most remarkable and their coefficient of correlation (r) was 0.88 (N-1965), the next was NO_2 and SO_2 indicating r equals 0.80 (N-1970) showing remarkable relationships. The mutual relationship between the pollutants were also recognized in terms of their daily average levels, for example: concerning NO and NO_2 in December, their coefficient of correlation was 0.71 (N equals 31). As to the time related variations of the levels of each pollutant, they were closely related to one another and the peak of each pollutant almost coincided.

11635 APTIC NO. 27493

Milligan, Dolphus E. and Marilyn E. Jacox

INFRARED SPECTRUM AND STRUCTURE OF INTERMEDIATE IN THE REACTION OF OH WITH CO. *J. Phys. Chem., 54(3):927-942, Feb. 1, 1971. 39 refs.*

Upon vacuum-ultraviolet photolysis of H_2O in a carbon monoxide matrix at 14 K, infrared absorption of HCO, H_2CO, HCOOH, and CO_2 became prominent. New absorptions due to reactive product species appeared at 615, 620, 1077, 1088, 1160, 1261, 1797, 1833, 3316, and 3456 reciprocal cm. These absorptions diminished in intensity when the sample was subjected to radiation at 2000-3000 A. These absorptions are assigned to the cis and trans stereoisomers of (H-O-C equals O), produced by the reaction of OH with the CO matrix. The pattern of observed frequencies for the various isotopic species of both cis and trans-HOCO are satisfactorily reproduced by valence form potentials having only small contributions from interaction terms and corresponding to a physically reasonable vibrational assignment. Evidence suggests that cis and trans-HOCO photodecomposes to produce H atoms and CO_2. (Author abstract modified)

11636 APTIC NO. 27522

Ripperton, Lyman A. and Lawrence D. Kornreich

ON THE APPARENT SIMULTANEOUS EXISTENCE OF NITRIC OXIDE AND OZONE IN STABLE ATMOSPHERIC REGIMES. *Preprint, Air Pollution Control Assoc., Pittsburgh, Pa., 21p., 1970. 8 refs. (Presented at the Air Pollution Control Association, Annual Meeting, 63rd, St. Louis, Mo., June 14-18, 1970, Paper 70-124.)*

In a study of the apparent coexistence of nitric oxide and ozone in the night-time atmosphere, it was concluded as unlikely that the two gases coexist, except in transitory situations. Nitrogen containing gases most likely to be present in the lower troposphere did not interfere with the sampling-analytical procedure devised for this study, with the possible exception of the alkyl nitrates. A Regener chemiluminescent instrument was used for measuring ozone, and a sampling train consisting of silica gel, Ascarite traps, and an oxidation trap containing potassium permanganate was used in connection with the normal Saltzman procedure for the measurement of nitric oxide. Nitrogen dioxide did not produce interference in this system and n-butyl nitrite produced no color unless the oxidizing step was present. There was a 19% conversion of n-butyl nitrite to NO in this system. Possible explanations are given as to the inhibition of the O_3-NO reaction. (Author summary modified)

11637 APTIC NO. 27533

Inaba, Fumio and Takao Kobayashi

MEASUREMENT OF AIR POLLUTION WITH LASER RADAR. *(Reza reda ni yoru taiki osen no keisoku). Text in Japanese. Denshi Kagaku (Electronic Sci.), 21(2):41-47, Feb. 1971. 29 refs.*

The ability of laser radar, or lidar (light detection and ranging), to obtain three-dimensional information about atmsopheric physical phenomena is evaluated. Real time data processing by lidar, which is morphologically more valuable than the chemical analysis of ground-level pollutants, is possible. Lidar is useful in the observation of atmospheric phenomena because it can detect very fine particulates (dust, aerosols, and water drops) floating in air. Laser radars have been employed at Stanford Institute since 1963 to detect the atmospheric layer where temperature inversions occur, the formation and disappearance of clouds, and invisible nighttime clouds and fogs. In Japan, studies on a laser radar have been in progress since 1964 at Tohoku University. The instrument has been used to estimate the attenuation rate of air and the particulate density distribution of fog and clouds and to analyze air pollutants. As a result of design improvements and the use of raman scattering, it is now possible to analyze concentrations of sulfur dioxide, nitrogen dioxide, nitric oxide, carbon monoxide, and ozone at and near the tops of stacks. Lidar is thus a useful tool for monitoring and controlling air pollution sources. Lidar air pollution measurement can also utilize the resonance effect.

11638 APTIC NO. 27540

7Davis, Briant L.

IN SITU X-RAY ANALYSIS OF ICE CRYSTAL FALLOUT FROM SEEDED CLOUDS. *J. Atmospheric Sci., 28(1):99-109, Jan. 1971. 11 refs.*

A cloud chamber mounted on a commercial x-ray diffractometer was used to obtain ice crystal shapes, numbers, and volume information from clouds seeded with silver iodide-sodium iodide aerosols. Data obtainable from this system included automatic printout of integrated diffraction intensities, photocell traces for fog densities, four-point temperature readout for the chamber, and optional Formvar replication. Aerosol efficiency data for the AgI-NaI particles were comparable to those generally published with the exception of two anomalies: a pronounced dip in the efficiency curve at -12 C, interpreted to mark the transition from condensation freezing to sublimation nucleation, and a maximum in the curve at approximately -20 C associated with a maximum in proportion of plates in the plate column crystal mixture. At -20 C and an aerosol dilution density of 500000/cu cm, about 5 times 10 to the 15th power active nuclei per gram of AgI are observed. At dilution densities in the 10 to the 8th power/cu cm range the efficiencies are reduced in order of magnitude. X-ray and Formvar replica data indicate that plates are most common from -17 to -22 C, with thick plates and short columns occurring above this temperature and long hollow columns and frozen water drops at progressively higher temperatures. The mean of the volumes ratios of plates to columns was observed for all runs to be 0.5. (Author abstract)

11639 APTIC NO. 27549

Nogami, Junji and Tsuguo Mizoguchi

HOW AIR POLLUTANTS ARE PRODUCED - ITS MECHANISMS. *(Taiki osen no hassei kiko). Text in Japanese. Kagaku Kogaku (Chem. Eng.), 35(1):14-24, Jan. 1971. 35 refs.*

The sudden growth of the national economy, the energy reformation, and the development of automotive traffic have markedly increased the number and quantity of air pollutants. Moreover, the combination of increasing quantities of atmospheric emissions has compounded the complexity of atmospheric pollution. Most of the pollutants are generated by combustion processes. However, there are other, secondary pollutants which are produced by interactions between airborne contaminants or by photochemical reactions. Some types of pollutants can be controlled by measures such as fuel desulfurization or combustion modification. Other types of emissions cannot be controlled by the adoption of such measures. There is a special type of pollutants in which the reduction of one pollutant inevitably causes an increase in another pollutant. On the other hand, emissions which are themselves harmless, but have an effect on other emissions have to be included among the atmospheric pollutants. This article classifies the various types of air pollution, discusses type of pollutants, air pollution control legislation, air pollution sources, including stationary and mobile, and the chemical reactions by which pollutants are produced.

11640 APTIC NO. 27551

Ito, Kyoji

ATMOSPHERIC DIFFUSION FROM SMOKE-STACKS. *(Entotsu kara no taiki kakusan). Text in Japanese. Kagaku Kogaku (Chem. Eng.), 35(1): 24-29, Jan. 1971.*

When considering atmospheric diffusion, it is customary to begin with diffusion from a single stack and then proceed to diffusion from multiple stacks. However, in the case of a large-scale industrial area, several thousand or more stacks have to be considered, and great difficulties are involved in computation. Here, a group of stacks must be regarded as a line source of air pollution in contrast to a single stack which is regarded as a point source. In considering air pollution caused by automobiles, the road itself must be regarded as a line source of pollution. Exhaust gas from airplanes and exhaust smoke from ships inside or outside of a harbor are becoming serious problems. Atmospheric diffusion is markedly influenced by atmospheric stability, which is usually determined by the vertical distribution of air temperature. In the case of lower atmospheric stratum, adiabatic changes in dry and wet conditions should not be neglected. As a typical example, the dry adiabatic change is discussed. Other subjects discussed are experimental methods for measuring atmospheric diffusion and the equation of atmospheric diffusion.

11641 APTIC NO. 27581

Taylor, O. Clifton

EFFECTS OF PHOTOCHEMICAL OXIDANTS ON VEGETATION IN URBAN AND SURROUNDING AREAS. *Preprint, Air Pollution Control Assoc., Toronto, Ontario Section, Air Pollution Control Assoc., Pittsburgh, Pa., TR-7 Agricultural Committee, and Ontario Dept. of Energy and Resources Management, Toronto. Air Management Branch, 12p., 1970. 18 refs. (Presented at the Impact of Air Pollution on Vegetation Conference, Toronto, Ontario, April 7-9, 1970.)*

A relatively new type of air pollutant associated with urbanized life is the 'oxidant' group or those gaseous products capable of oxidizing a buffered potassium iodite solution, cracking rubber products, injuring sensitive vegetation, and irritating mucus membranes. These products include nitrogen oxides, ozone, and peroxyacyl nitrates (PANs) generated photochemically from effluents of the combustion of organic fuels. Symptoms of ozone injury on plants range from collapse of extensive areas of the leaf blade to discrete upper surface necrotic spots, chlorosis, abscission of leaves, fruits and blossoms, and suppression of growth without visible symptoms of injury. The extent of injury and the nature of symptoms vary widely with type of plant, concentration of toxicant, duration of exposure, and environmental conditions. Visible injury can occur on sensitive plants with 5 pphm ozone. Peroxyacetyl nitrate produces glazing, bronzing or silvering of the lower surface of sensitive leaves. Typically, the injury is confined to transverse bands across the leaf. Injury can result from as little as 14 ppb. Nitrogen oxides are relatively nontoxic. Visible injury can occur with 6 ppm NO2 when plants are in sunlight or with 2 or 3 ppm if the plants are in darkness. Leaf injury closely resembles sulfur dioxide injury and typically occurs as large collapsed intercostal lesions. Both nitrogen dioxide and nitric oxide interfere with photosynthesis, but nitric oxide does not produce visible permanent injury. (Author abstract modified)

11642 APTIC NO. 27606

Lamb, R. G. and M. Neiburger

MATHEMATICAL MODEL OF THE DIFFUSION AND REACTIONS OF POLLUTANTS EMITTED OVER AN URBAN AREA. *In: Project Clean Air. California Univ., Los Angeles, Dept. of Meteorology, Research Proj. S-13, Vol. 4, 19p., Sept. 1, 1970. 2 refs.*

A stochastic continuity equation was developed for use as the basis for an urban air pollution model. This equation describes the transport of chemically reactive substances in turbulent fluids. To simulate the transport of photochemical pollutants in an urban atmosphere, certain relationships must exist among the turbulent characteristics of the wind, the spacing of wind stations and period of averaging of the wind observations, and the reactivity of the pollutants. As a step toward determining criteria regarding these relationships, measurements were made of the turbulent fluctuations of the wind at two levels at a location which may be indicative of their behavior in typical urban conditions. The various averages and correlations required by the equation are being computed. It appears from preliminary evaluations that the scales of turbulence are sufficiently small to enable use of hourly averaged wind observations from the network of wind stations over the Los Angeles Basin (approximately 30 stations over a 4000 square kilometer area) to permit the computation of the behavior of most of the reactive contaminants. (Author abstract modified)

11643 APTIC NO. 27618

Bach, Wilfrid

VARIATION OF SOLAR ATTENUATION WITH HEIGHT OVER AN URBANIZED AREA. *Preprint, Air Pollution Control Assoc., Pittsburgh, Pa., 40p., 1970 23 refs. (Presented at the Air Pollution Control Association, Annual Meeting, 63rd, St. Louis, Mo., June 14-18, 1970, Paper 70-80.)*

Measurements were made of the magnitude of solar attenuation for individual air layers in the lowest 1000 m of the atmosphere over Cincinnati, revealing an extremely diverse variation of mass concentration with height. The data were gathered on different roof top levels and on helicopter flights using modified Volz sun photometers, psychrometers, hot-wire anemometers, and an electrical thermometer. Results show that on a 'polluted day' the lowest 1000 m of air attenuate about 65% of the solar beam, whereas on a 'clean'0 day the contribution to the total solar attenuation is still 30%. Shallow air layer increments of 45 m near the ground contribute up to 21% to the total solar attenuation. Aerosols form the dominant attenuation component in polluted air layers near the ground, whereas the extinction due to air molecules becomes dominant in higher and relatively cleaner atmospheric air layers. The results obtained utilizing the Schuepp and Elterman approaches are compatible. Significance tests show that turbidity variations with height over widely spaced locations are relatively homogeneous This may indicate a rather uniform spread of the urban dust dome over the neighboring countryside. No significant change in the vertical turbidity structure was found between data collected in 1961/62 and 1969. (Author abstract modified)

11644 APTIC NO. 27625

Ripperton, Lyman A. and Daniel Lillian

THE EFFECT OF WATER VAPOR ON OZONE SYNTHESIS IN THE PHOTO-OXIDATION OF ALPHA-PINENE. *Preprint, Air Pollution Control Assoc., Pittsburgh, Pa., 35p., 1970. 18 refs. (Presented at the Air Pollution Control Association, Annual Meeting, 63rd, St. Louis, Mo., June 14-18, 1970.)*

A study was undertaken to examine the effects of water vapor on the synthesis of ozone in the system NO2 + alpha-pinene + hv. Representative concentrations of 10 pphm NO2 and 50 pphm alpha pinene were used in a 3 times two times two factorial design where absolute humidites of 0.0000, 0.0090, 0.0180 g H2O/g dry air were varied. A bank of ultraviolet and fluorescent lamps served as the source of simulated solar radiation. Upon irradiation, systems containing NO2 and alpha-pinene formed oxidants, ozone, condensatio nuclei, and nitric oxide. Based on differences between simultaneou oxidant and oxidant measurements, the formation of peroxide-like compounds is inferred. During the course of the irradiation, nitrogen dioxide and alpha-pinene were consumed. The concentration profiles of all reaction products were characteristic of those exhibited by typical photochemical smog systems. An effect of water vapor on the systems studied was demonstrated. Increasing humidity decreased net mean/time oxidant and ozone production and net maximum condensation nuclei production. These effects were significant at an 0.5 confidence level. Effects of water vapor on average mean/time NO2, NO, and alpha-pinene concentrations were insignificant at this level. The oxidant-to-ozone ratio decreased with increasing humidity. The significant decreases in net oxidant and ozone production and NO2 consumption with increasing water vapor concentration in systems of NO2 alone suggests that water manifests an effect on pertinent inorganic reactions. The experimental data also indicate additional participation in the organic reactions. (Author abstract modified)

11645 APTIC NO. 27632

Mosher, J. C., W. G. MacBeth, M. J. Leonard, T. P. Mullins, and M. F. Brunelle

THE DISTRIBUTION OF CONTAMINANTS IN THE LOS ANGELES BASIN RESULTING FROM ATMOSPHERIC REACTIONS AND TRANSPORT. *J. Air Pollution Control Assoc., 20(1):35-42, Jan. 1970. 11 refs.*

Different techniques of data analysis have been successfully applied to Los Angeles County air monitoring data to delineate major source areas for carbon monoxide, sulfur dioxide, nitrogen oxides, and ozone; to develop contaminant transport patterns; and to demonstrate the progress of photochemical reactions in the Los Angeles atmosphere. The heavily industrialized South Coastal, Southwest Coastal, and East San Fernando Valley areas are affected most by contaminants derived from fuel combustion at stationary sources. Emissions from mobile sources are heavily concentrated in some of the above source areas and also in the Central area. Seasonal variations in weather affect the total contaminant emissions as well as the distribution, transport, and ultimate fate of the individual contaminants. More frequent surface inversions in winter, combined with greater quantities of emitted contaminants result in winter time atmospheric concentrations of primary contaminants (carbon monoxide, nitric oxide, sulfur dioxide, and particulates) more than twice as high as comparable summer time concentrations. Stronger on-shore breezes of longer duration transport contaminated air parcels farther across the County during summer. Longer, more effective irradiation and low persistent inversions result in higher ozone concentrations in summer. Air monitoring data confirm the photochemical formation of ozone during transport of air parcels along the most common 'pathways' of transport; the prevailing wind flows from coast to inland areas. (Author abstract)

11646 APTIC NO. 27642

Ministry of Health and Welfare, Tokyo (Japan), Air Pollution Phenomenon in Urban Area Study Group

STUDY ON COMPUTER UTILIZATION FOR PREVENTION OF AIR POLLUTION. *(Taikiosen boshi no konpyuta riyo ni kansuru kenkyu). Text in Japanese. Japan Ministry of Health and Welfare Rept. for 1969, 118p., March 1970. 21 refs.*

For the purpose of clarifying the actual situation of sulfur dioxide pollution in Dec. 1968 and Aug. 1969, the relation between the daily change pattern of the concentration and the high concentration of pollution, the difference between day-night and summer-winter, hourly changes on high concentration days, and the relation to wind were studied, based on the measurement values of SO2, wind direction, and wind velocity. A mathematical model of the City Air Pollution System was divided into Receptor Oriented Model and Source

Oriented Model. The Miller Model, the diffusion model of the former, is going to be used most widely and is applied to the air pollution phenomena in Tokyo and its surrounding area. The needs to develop and utilize the source Oriented Model in order to guide the most reasonable and effective pollution policy is indicated; however, the greatest fault of this model is that it is difficult to get the accurate information about the information source. The effectiveness of Puff Model which has been developed with the support of the National Air Pollution Control Administration is evaluated. The trial calculation by computer using model formula show its practicality in Tokyo district.

11647 APTIC NO. 27662

Dimitriades, Basil and Marvin Whisman

CARBON MONOXIDE IN LOWER ATMOSPHERE REACTIONS. *Environ. Sci. Technol., 5(3):219-22, March 1971. 12 refs.*

The participation of carbon monoxide in lower atmosphere reactions was studied by exposing C14-labeled CO to reaction mixtures and conditions typically prevailing in polluted atmospheres. The rate of C14O2 formation following irradiation of the mixtures was measured and taken to represent the rate of CO oxidation. The CO oxidation rate is approximately 0.1%/hr of sun irradiation or 0.05%/hr of daytime or nightime; such a rate suggests a lifetime of CO in the troposphere equal to 0.3 yr. The observed rates of CO oxidation cannot be explained in terms of CO reactions with oxygen atoms and ozone alone; the presence of CO at typical levels does not necessarily affect the process of photochemical smog formations. (Author conclusions modified)

11648 APTIC NO. 27788

Ohira, Toshio

ON PHOTOCHEMICAL SMOG IN TOKYO. *(Tokyo-to ni okeru kogakusmoggu ni tsuite). Text in Japanese. Tokyo-to Kogai Kenkyusho-ho (Tokyo Public Nuisance Res. Inst. Bull.), no. 1-4-2:1-40, Aug. 1970.*

Data is presented on atmospheric oxidants whose density was recorde hourly over the period from 1967 to July, 1970, in Tokyo. It discusses the Tokyo photochemical smog occurrences in relation to these data and other recorded data such as weather conditions. The atmospheric oxidant measurement method used by the Tokyo research institute is a neutral potassium iodide colorimetric method. The measuring principle of this method is that ozone reacting with potassium iodide liberates iodine, whose ultra-violet absorbency is measured and converted to ozone value. When a high density of oxidant was defined as an hourly value of 0.15 ppm or higher, there were 12 such high-oxidant-density days (a total of 21 hours) in 1967, 14 days (27 hours) in 1968, 9 days (19 hours) in 1969, and 15 days (42 hours) in 1970 (up to July), indicating an up trend bot in number of days and in total hours, year after year, except in 1969. From the same data, it is apparent that the oxidant is rather short-lived and remains for about 2 hours on the average. Its density increases with the increase of ultraviolet rays after sunrise and reaches its peak at around 11:00-13:00 hours, thereafter decreasing with the decrease of ultraviolet rays. Most of the high-density days were in June, July, and August. On the other hand, the density of nitrogen dioxide reaches its peak at around 11:00-13:00 hours as does the oxidant but, unlike the oxidant, it peaks again some time between evening and night. The density of nitric oxide is usually low in the daytime and high at night, in contrast to that of oxidant.

11649 APTIC NO. 27884

Gil denskiol d, R. S., B. B. Goroshko, G. A. Panfilova, and B. V. Rikhter

RESULTS OF EXPERIMENTAL STUDIES OF ATMOSPHERIC POLLUTION IN THE REGION OF THE MOLDAVIAN GRES (STATE REGIONAL ELECTRIC POWER PLANT (SREEP)). *In: American Institute of Crop Ecology Survey of USSR Air Pollution Literature. M. Y. Nuttonson (ed.), Vol. 1, Silver Spring, Md., American Institute of Crop Ecology, 1969, p. 96-99. 7 refs. (Also: Tr. Gl. Geofiz. Observ., no. 207:65-68, 1968.)*

A tentative method for calculating the dispersion of ash and sulfur gas from electric power stations was tested by application to tall stacks (18-m high and 6-m diameter). In field investigations, measurements of sulfur gas and ash concentrations in the zone of influence of the smoke plume were made at various distances from the source. The calculated maximum sulfur gas concentration and the wind velocity at which the maximum occurs were in good agreement with experimental data. Calculated theoretical changes of the concentration of sulfur gas at various distances from the source at different wind velocities were in satisfactory agreement with experimental data. Satisfactory agreement was also obtained between observed plume rise and plume rise calculated as a function of wind velocity at the height of the source. Measured ash concentrations, which varied markedly, were found to contain a larg amount of organic particles as the result of harvesting work being done in the area.

11650 APTIC NO. 28807

Hewson, E. Wendell and Gerald C. Gill

METEOROLOGICAL INVESTIGATIONS IN COLUMBIA RIVER VALLEY NEAR TRAIL, B. C. *(Part II of: Report Submitted to the Trail Smelter Arbitral Tribunal. Bull. Bureau of Mines, no. 453:23-228, 1944.*

Sulfur dioxide emitted from the stacks of the Trail Smelter is carried along in and dispersed by the air currents in and above the Columbia River Valley near Trail. Since the whole future course of the smoke after it leaves the stacks depends entirely on these currents, a detailed knowledge of their local and general characteristics is presented. Topographical effects are indicated, as well as seasonal and diurnal variations and types of fumigation. For continuous records of SO2 concentrations at various points down the Columbia River Valley, Thomas autometers have been in use since November 1929. The recorders are described and distribution of sulfur dioxide in the valley is discussed. A study of the times of occurrence of fumigations over a period of several years reveals a marked difference between the nongrowing and the growing season. Portable SO2 measurements were made as part of the program to determine the mechanism by which the smoke layer becomes broken up after sunrise on summer mornings. Airplane ascents were made to acquire a full knowledge of winds, eddies, temperatures, and SO2 concentrations. Balloon observations were also made, and the various methods are described. Anemometers were utilized, as well as methods to forecast wind directions and fumigations. Geostrophic winds, pressure distributions, turbulence and its measurement, the influence of lapse rate, temperature measuring instruments, distribution of temperature, and photographs illustrating the influence of various meteorologica elements of smoke diffusion are all included.

11651 APTIC NO. 28827

Ohmstede, William D.

A SIMILARITY MODEL FOR ATMOSPHERIC TURBULENCE STRUCTURE IN THE PLANETARY BOUNDARY LAYER. *Army Electronics Command, Fort Huachuca, Ariz., Atmospheric Sciences Lab., 14p., 1970. 15 refs.*

NTIS, DDC: AD 713 569

A study was undertaken to develop, from basic principles, a rationa hypothesis for the prediction of turbulence structure in the planetary boundary layer, including means to assess the limitations and methods to further generalize the hypothesis. The general hypothesis states that, for any given situation, closure of the hierarchy of dynamic equations for turbulent interactions can be obtained at a level of finite order by equating each turbulent interaction term at that level to the sum of products of the associated generative terms and ratios of appropriate Eulerian length and velocity scales.

11652 APTIC NO. 28854

Briggs, Gary A.

A SIMPLE MODEL FOR BENT-OVER PLUME RISE. *Pennsylvania State Univ., University Park, Thesis (Ph.D.), Oak Ridge, Tenn., National Oceanic and Atmospheric Administration, 1970, 112p. 73 refs.*

A model has been developed that predicts the rise of a continuous gaseous emission above its source height when it is bent by a wind. While the model is consistent with physical considerations, it has been made as simple as possible so that it can easily be utilized in the prediction of diffusion of pollutants. The basic assumption are that mass, buoyancy (potential temperature), and momentum are conserved, with new vertical momentum being generated only by buoyancy forces. The flow is assumed to be stationary. The equations for bent-over plume rise are simplified by approximating the horizontal component of the mean plume motion by the mean ambient wind velocity at the height of the plume center line. The vertical drag force on the plume can be neglected. In order to close the equations, it is assumed that the plume radius, r, is proportional to the plume rise above the source in the first stage of rise. Empirical evidence shows that the constant of proportionality is about 0.5 for a buoyancy-dominated plume, and a function of the ratio of efflux velocity to wind speed for a momentum dominated plume. When atmospheric turbulence is present, a second stage of rise occurs when the first stage growth rate of r, dr/dt, is exceeded by the second stage growth rate of r. The latter quantity is assumedttotzte a function of r itself and of epsilon, which determines the characteristics of turbulent flow in the inertial subrange of atmospheric turbulence; dimensional analysis then suggests that dr/dt is porportional to epsilon to the 1/3 power times r to the 1/3 power. A semi-empirical relationship is developed for plumes in which both momentum and buoyancy are factors. (Author abstract modified)

11653 APTIC NO. 28863

Peters, L. K. and L. B. Wingard, Jr.

THE OZONE OXIDATION OF ETHYLENE AS IT PERTAINS TO AIR POLLUTION. *Pittsburgh Univ., Pa., Dept. of Chemical and Petroleum Engineering, Grant NGL 30-011-002, SRCC Rept. 132, 34p., July 24, 1970. 36 refs.*

NTIS: N 70 42269

The ozone oxidations of hydrocarbons are important reactions in air pollution because they represent a significant step in the formatio of photochemical smog. Smog formation is a nonequilibrium process dependent on the rates of a sequence of reactions involving nitroge oxides, atomic oxygen, ozone, and hydrocarbons. Published data on the kinetic rate constants for the ozone oxidation of hydrocarbons are reviewed, and the results of an experimental study of ozone decomposition and ozone-ethylene reaction stoichiometry are presented. The experimental study was made using cylinder ozone dissolved in Freon-13, and involved monitoring the pressure changes that occurred during reaction in a constant volume glass reactor. With this technique, the ozone decomposition rate was much higher than that predicted by published data, apparently from catalytic effects or reactions involving the Freon-13. In the ozone oxidatio of ethylene, the effect of the initial reactant ratio was significant, and the data indicated that competing reactions were involved. Finally, several factors requiring clarification are cited, and suggestions for additional experimental work are included. (Author abstract)

11654 APTIC NO. 28892

Koopman, David W.

LIGHT-ION CHARGE EXCHANGE IN ATMOSPHERIC GASES. *Phys. Rev., 166(1):57-62, Feb. 5, 1968. 21 refs.*

As part of a program to study charge-exchange process for light ions, measurements were made of total charge-exchange cross sections for H+, H2+, and He+ incident on nitrogen, oxygen, carbon dioxide, and water in theenergy range 40-1500 eV. Such reactions are of interest in the upper atmosphere, in the atmospheres of planets where the absence of a magnetic field would allow direct bombardment by the solar wind, and in laboratory situations where these species may be present, perhaps as impurities. Details of the collision chamber and experimental procedure are presented. Except for protons incident on N2 and O2, the processes examined have cross sections which continue to rise at energies below 200 eV, and can be understood by applying adiabatic theory criteria to the ground states of the species involved. The experimental evidence that the processes He+ plus N2 and He+ plus O2 yield energentic products, when coupled to previous determinations of dissociated products for these reactions, appears to confirm that charge exchange to unstable excited states dominates these reactions. Suggestions for further experimental studies of charge-exchange processes are indicated.

11655 APTIC NO. 28901

Storms, Kenneth R.

LOW SPEED WIND TUNNEL INVESTIGATION OF A JET DIRECTED NORMAL TO THE WIND. *Washington Univ., Seattle, Aeronautical Lab. UWAL-885, 13p., Nov. 1965.*

Wind tunnel experiments were conducted to determine what becomes of a jet of air when it is injected at right angles into a moving stream of air. The path of the jet was found to vary with ratio of jet velocity to wind velocity and jet orifice position. An empirical cubic equation was derived which fairly closely represents the path of the jet plume. The results of this investigation should be useful in calculating performance of V/STOL aircraft when it is necessary to know the characteristics of the path of the supporting steam of air or jet exhaust.

11656 APTIC NO. 28912

Ukeguchi, Nobuhiro, Hiroki Okamoto, and Yasuo Ide

TURBULENT DIFFUSION AND TURBULENT BOUNDARY LAYER. *Staub (English translation from German* *of: Staub, Reinhaltung Luft), 30(8): 29-36, Aug. 1970. 9 refs.*

Theoretical and experimental investigations were carried out on smoke plumes continuously emitted by point sources at differing heights above ground level and diffusing turbulently. The results show that, within the turbulent boundary layer, the coefficient of the turbulent diffusion first increases with increasing distance from the ground, attains a maximum at a certain height, and subsequently converges asymptotically toward the lower value in the uniform flow. If the point source is located within the turbulent boundary layer, the maximum ground level concentration will decrease with increasing source height; if the source is located outside the boundary layer, the maximum ground level concentration will also decrease with increasing source height. A method is given for calculating the diffusion of smoke source from a point source at an arbitrary height, both within and outside the turbulent boundary layer. (Author conclusions modified)

11657 APTIC NO. 28915

Kopczynski, S. L.

PHOTO-OXIDATION OF ALKYLBENZENE-NITROGEN DIOXIDE MIXTURES IN AIR. *Intern. J. Air Water Pollution (London), vol. 8:107-120, 1964. 25 refs.*

Measurements of the relative reaction rates of various alkylbenzenes in photooxidative reactions with NO2 in air are reported. The reaction rates are compared with the relative basicities of the compounds. A partial analysis of the gas phase and condensed phase products is also reported. It appears that as much as 50 per cent of the reacted carbon atoms may be contained in the condensed phase. The several irradiation and analytical techniques employed are compared. The photo-oxidation reactions of olefins and alkylbenzenes are compared. Free radical chains appear to play a more important role in the photo-oxidation reactions rates of certain alkylbenzenes than in the reaction rates of olefins. Hyperconjugative interaction of the methyl groups with the aromatic ring is proposed as a possible explanation of the orde of reactivity of various isomers of the methyl-substituted benzenes. (Author abstract)

11658 APTIC NO. 28916

Stephens, E. R.

CHEMISTRY OF ATMOSPHERIC OXIDANTS. *J. Air Pollution Control Assoc., 19(3):181-185, March 1969. 15 refs.*

All of the important oxidants in polluted air are formed there by chemical reactions which occur among the primary pollutants. The most abundant of these oxidants is ozone which is formed in a cycle involving nitric oxide, nitrogen dioxide, atmospheric oxygen, and hydrocarbons. This ozone is best understood, not as a reaction product, but as an intermediate in steady-state concentration between formation and disappearance reactions. Hydrocarbons permit accumulation of ozone by reacting to scavenge the nitric oxide which would otherwise remove the ozone. The amount of ozone which can be formed in ambient polluted air is limited to about 1 ppm because these scavenging reactions become less effective when the nitric oxide concentration becomes very small. The peroxyacyl nitrates are a group of oxidants which result from reactions between oxides of nitrogen and organic pollutants. Olefinic and aromatic hydrocarbons make the largest contribution to PAN formation; saturates contribute little if any. The role of nitrogen dioxide and other oxidizing agents is also discussed. (Author abstract)

11659 APTIC NO. 28922

Olson, J. S.

LINKING ATMOSPHERIC AND ECOSYSTEM MODELS FOR CARBON BUDGETS. *In: Ecological Sciences Division Annual Progress Report. Oak Ridge National Laboratory, Tenn., Ecological Sciences Div., Pub. 385, p. 74-76, Feb. 1971. 17 refs.*

NTIS: ORNL-4634

Conceptual models and mathematical models of the carbon cycle will be important in predicting the fate of carbon-14, and of excess of carbon dioxide generated by fossil fuels and other sources. The mathematical models of Eriksson and Welander first treated the subsystem of green land plants, dead organic material, and atmosphere in terms of nonlinear differential equations and concluded that these dominated changes in atmospheric CO2 over time scales of years and decades. They considered the sea primaril as a 'damping factor' of possibly greater importance for oscillations over periods of centuries or millenia. Geochemical investigations by others have used stable and radioactive isotope ratios to evaluate the compartmental exchanges between atmosphere and shallow and deep layers of the ocean. The role of vertical movements of organisms in hastening this exchange is recognized. Various data and refinements of an atmospheric compartment submodel were reviewed by Nydal. Instead of assuming a single well-mixed atmospheric compartment, several authors have distinguished the reservoirs Rs and Rt (stratosphere and troposphere, respectively, separated by the tropopause).

11660 APTIC NO. 28927

Allison, John K., Albert V. Duffield, and John M. Morton

METEOROLOGICAL ANALOG TEST AND EVALUATION: FIRST FIELD TEST OPERATION. (FINAL REPORT). *Melpar, Inc., Falls Church, Va., Meteorological Research Lab., DTC Contract DA 42-007-AMC-339 (Y), Task VIII B, 172p., June 1970. 5 refs.*

NTIS,DDC: AD 713009

A total of 115 diffusion trials using fluorescent particle (FP) tracers were conducted from August 1 through November 24, 1968, within and above a hardwood forest. During this period, meteorological data from a centrally located tower were digitized and recorded on magnetic tape. Concurrent with the diffusion trials, 50 0.1 hectare plots were surveyed by traditional forestry methods, and digitized canopy contours were recovered from stereo-pair aerial photographs. The data were summarized and reduced to provide quantified, descriptive terms of th diffusing cloud, the meteorological regime, and the forest physical characteristics for later comparison with similar trials to be conducted in different forests. Diffusion parameters, included cloud width, cloud thickness, direction of movement, speed of movement, and vertical meander. Meteorological parameters included vertical profiles of wind speed, direction, and stability. The final significance of the data will not be known until results are compared with data for other forests. Differences between cloud parameters measured before and after leaf fall are discussed.

11661 APTIC NO. 28937

Nonhebel, G.

HEIGHTS OF CHIMNEYS. *In: Gas Purification Processes. G. Nonhebel (ed.), London, George Newnes Ltd., 1964, Chapt. 19, p. 824-880. 66 refs.*

New knowledge on chimney design to ensure adequate dispersal of chimney gases and general rules to be followed are summarized. Power station chimneys should be at least 2.5 times the height of adjacent buildings to overcome the effects of downdraught and as slender as possible to avoid downwash. The formula for calculating the height necessary to overcome the effect of downdraught is given. A minimum height of 120 ft for emissions from chemical processes is suggested. Recommended heights for smal industrial boiler plants with relatively innocuous effluents are tabulated. The discharge velocity should be 50-60 ft/sec. Acceptable ground-level concentrations of gases derived from chimney discharges are discussed in terms of effects on human beings, farmstock, and vegetation. Methods are given for calculating the concentration which reaches the ground from a chimney by the process of eddy diffusion and for rate of dust deposition. The daily rate of coverage of surfaces by deposited dust should not exceed 0.04%. Formulas for calculation of gas concentrations downwind of a chimney and examples of the two steps of calculation (the maximum height of plume rise and downwind concentration) are given. Two equations and an example for determining the distance from the chimney at which the plume becomes substantially invisible are included.

11662 APTIC NO. 28942

Miller, Lewis W.

THE CHEMISTRY OF THE OXIDES OF NITROGEN IN THE UPPER ATMOSPHERE AND THE RESULTS OF A CONTINENT-WIDE PRECIPITATION CHEMISTRY PROGRAM FOR THE ANALYSES OF NO3- AND NH4 PLUS IN RAIN WATER. *J. Air Pollution Control Assoc., 8(2):138-146, Aug. 1958. 46 refs. (Presented at the American Chemical Society, 132nd National Meeting, New York, Sept. 8-13, 1957.)*

The origin and fate of atmospheric nitrous oxide are examined, with reference to homogeneous gas reactions in the upper atmosphere and its photochemical dissociation by ultraviolet light. Formation and loss of atmospheric nitric oxide and nitrogen dioxide are also considered. Rate coefficients and absorption continua are indicated. The brief discussion of the recent photochemistry and vertical distribution of the oxides of nitrogen seems to indicate that nitric oxide and nitrogen dioxide formed by the photodissociation of nitrous oxide in the upper atmosphere cannot b expected to diffuse downwards through the ozonosphere to yield any appreciable concentration on the surface of the earth. In the ozonosphere the concentration of ozone is one to two orders of magnitude greater than nitrous oxide and its photodissociation products. This would exclude the possibility of these oxides reaching ground level. Results of rain water analyses for ammonium and nitrate ion concentrations also eliminate the possibility of the formation of this component from NO2 as a source in high tropospheric levels. The fixation of NO3 and N from lightning has also been shown to have no correlation with the amount of NO2 on the earth's surface. Nitrogen dioxide as an air pollutant is discussed, as well as the interpretation of maps indicating the presence of nitrogen oxides. (Author conclusion modified)

11663 APTIC NO. 28951

Melfi, Samuel Harvey

RAMAN BACKSCATTER OF LASER RADIATION IN THE EARTH'S ATMOSPHERE. *William and Mary Coll., Williamsburg, Va., Dept. of Physics, Thesis (Ph.D.), Springfield, Va., National Technical Information Service, 1970, 147p. 36 refs.*

NTIS: N70-41237

Laser optical radar techniques were applied to the measurement of Raman backscatter in the atmosphere by nitrogen, oxygen, and water vapor, and ratios of the water vapor to nitrogen Raman return signals were compared to independent radiosonde measurements of water vapor mixing ratio. Initial experiments performed using a dual monochromator indicated good agreement to altitudes above 1 km. In later experiments, using interference filters, agreement was good to altitudes above 3 km, with some disagreement evident below 1 km. The disagreement below 1 km may be due to relatively intense aerosol scattering not totally blocked by interference filters used to select the Raman band. A concise treatment of Raman and Rayleigh scattering by molecules is presented for the geometry of the optical radar system and includes calculations of Rayleigh and vibrational Raman backscatter cross sections for nitrogen and oxygen, including rotational fine structure. A detailed description of the optical radar system is given along with a noise analysis of Raman backscatter in the atmosphere. In addition, the ratio of the elastic scattered return to the nitrogen return signal was compared to the results of a balloon-borne dust photometer, with good agreement to above 3 km. Raman optical radar measurements of both water vapor and aerosol mixing agree with a qualitative analysis of turbulent mixing in the atmosphere. (Author abstract modified)

11664 APTIC NO. 28960

Fritschen, Leo J., Charles H. Driver, Charles Avery, John Buffo, Robert Edmonds, Russell Kinerson, and Peter Schiess

DISPERSION OF AIR TRACERS INTO AND WITHIN A FORESTED AREA: 2. *Washington Univ., Seattle, Coll. of Forest Resources, Grant DA-AMC-28-043-68-G8, Proj. ITO-61102-B53A, Task 17, TR ECOM-68-G8-2 334p., June 1970.*

NTIS, DDC: AD 711116

Data are compiled for the dispersion of fluorescent particle tracers and spores of Fomes annosus into and within a forest canopy from a clearcut area in relation to meteorological conditions. A total of 111 rotorod samplers were used to trap the tracers within a canopy volume of 20 m height, 210 m width, and 270 m length. Wind speed and direction and air temperature were monitored on five towers on a line perpendicular to the forest wall. A summary of release times, locations, heights, methods, and materials is presented in tabular form. Data collected are listed by run number, release number, and date. Meteorological data are listed in an appendix, also by run number, release number, and date.

11665 APTIC NO. 28962

Eschenroeder, A. Q. and J. R. Martinez

ANALYSIS OF LOS ANGELES ATMOSPHERIC REACTION DATA FROM 1968 AND 1969. (FINAL REPORT). *General Research Corp., Santa Barbara, Calif., CRC-APRAC Proj. CAPA-7-68, CR-1-170, 84p., July 1970. 33 refs.*

NTIS: PB 196 825

Analysis of air pollution data from the National Air Pollution Control Administration and the Coordinating Research Council (NAPCA/CRC) Los Angeles basin program identifies some of the significant photochemical aspects of the control problem. Data processing of the detailed gas chromatograph measurements provides distributions of hydrocarbons among reactivity classes. Mole-weighted averages place the hydrocarbon mixture between ethylene and 1-alkenes on a biological-effect response scale. Upper bound curves for peak hourly oxidan show that somewhat more stringent control would be needed for nitrogen oxides than for nonmethane hydrocarbons (NMHC) to achieve a given oxidant standard. Ratios of NMHC to nitrogen oxides less than unity appear to avoid optimum oxidant production. Further analysis shows that emission source proportion of nitrogen oxides to inerts (such as CO and C2H2) are not reflected in morning air samples on high oxidant days. The apparent nitrogen oxides deficiency is greater for Huntingdon Park (1968) than for Commerce (1968). Tests employing the 1969 data indicate a breakdown of the quasi-equilibrium assumption for the NO/NO2/O3 cycle as ozone concentrations depart from zoro. For ozone concentrations less than 0.1 ppm, the two sides of the quasi-equilibrium equation lie within a factor of three of one another. The helicopter and tetroon results are likely to prove useful as validation benchmarks for mathematical modeling studies. Future field programs should concentrate on reliability more than on quantity of data. (Author abstract modified)

11666 APTIC NO. 28964

Bach, Walter D., Jr. and James R. Smith

ATMOSPHERIC AND OCEANOGRAPHIC SUPPORT STUDIES FOR LASER RADAR EXPERIMENT ABOARD THE ADVANCE II DURING BOMEX. *Research Triangle Inst., Research Triangle Park, N. C., Engineering and Environmental Sciences Div., Contract NAS1-9161, NASA CR-66978, 27p., Aug. 1970. 11 refs.*

NTIS: N70-38552

During June and July 1969, the NASA optical radar system was operated on a cruise from Wilmington, North Carolina, through the Barbados Oceanographic and Meteorological Experiment area, to the mouth of the Amazon River. Over 800 laser firings were made to investigate the features of the marine atmosphere and to evaluate the performance of the laser within a marine environment. Frequent radiosonde releases were made to obtain data on the thermal and moisture structure of the atmosphere. Analyses of both high altitude (greater than 15 km) and low altitude (greater than 3 km) laser data were made for one of the observing stations. The presence of dust layers between 15 and 25 km was verified. Short-term changes in dust concentrations and the laser profile characteristics were noted. Data obtained by varying the elevation angle of the laser and firing at approximately one-min intervals permitted the construction of space cross sections through the planetary boundary layer. The resulting distribution show characteristics of a dry convective regime having the dimensions and other properties of fair weather cumulative clouds. Estimates of vertical wind velocities were made. The intertropical convergence zone was located by an air trajectory analysis. Measurements of particle number density to the south of that zone showed an order of magnitude decrease in large (greater than 1 micron) particles from measured number densities to the north of the zone. (Author abstract modified)

11667 APTIC NO. 28967

Atwater, Marshall A.

THE RADIATION BUDGET FOR POLLUTED LAYERS OF THE URBAN ENVIRONMENT. *J. Appl. Meteorol. 10(2):205-214, April 1971. 23 refs.*

A radiation model is used to examine the possible effects of pollutants, particularly aerosols and nitrogen dioxide, on the thermal structure of the urban atmosphere. Discontinuities in the lapse rate, which develop at successive iterations of the radiation model, are removed by use of a one-sided space finite difference at the lowest atmospheric grid level. The surface temperature is specified as a function of time, and pollutant concentration is assumed constant with time. Pollutants are a possible cause of elevated inversions that occur over cities. Scattering and absorption of both solar and infrared radiation occur within the polluted layer and there is an emission of longwave radiation. The net effect of these radiative processes during the night is a market cooling of the polluted layer. The net effect on temperature during the day depends on the relative magnitude of heating caused by absorption of solar radiation and the cooling due to infrared radiation. These effects should be included in a realistic simulation of the urban meteorology. (Author abstract modified)

11668 APTIC NO. 28970

Varanasi, P. and G. D. T. Tejwani

HALF-WIDTH CALCULATIONS FOR CO LINES BROADENED BY CO2. *J. Quant. Spectr. Radiative Transfer, 11(3):255-261, March 1971. 18 refs.*

Half-widths of carbon monoxide, spectral lines, in the fundamental and first overtone bands, broadened by carbon dioxide were computed by means of the Anderson-Tsao-Curnette theory. Comparison with the high-resolution measurments of Varanasi at 295 K showed excellent prediction of line widths by the theory. Comparison was also made between calculations including dipole-quadrupole and quadrupole-quadrupole interactions with those taking only the dominant quadrupole-quadrupole forces into account. Line widths at 295 K were 0.12647 reciprocal cm reciprocal atm for m equals 1 to 0.04397 reciprocal cm reciprocal atm for m equals 32, which corresponds to the asymptotic kinetic theory value. Half-width computations are also presented at 200 K and 250 K appropriate for Martian and Venusian atmospheres, respectively. (Author abstract modified)

11669 APTIC NO. 28973

Elterman, L.

RELATIONSHIPS BETWEEN VERTICAL ATTENUATION AND SURFACE METEOROLOGICAL RANGE. *Appl. Opt. 9(8):1804-1810. Aug. 1970. 17 refs.*

NTIS, DDC: AD 714050

An examination of the haze regime, used in the sense of diminished surface meteorological range, shows that the lower and upper limits can be defined by meteorological ranges 1.2 km and 15 km, respectively. To develop relationships between surface haze and vertical attenuation, eight meteorological ranges are selected from within these limits. Vertical aerosol attenuation parameters are then computed by deriving an aerosol scale height for each meteorological range. A sample tabulation for one of the twenty wavelengths in the ultraviolet, visible, and infrared is presented and combined with previously published attenuation parameters (aerosols, molecules, and ozone) to the 50-km altitude. (Author abstract modified)

11670 APTIC NO. 28977

Endow, Tatsuo and Choji Magono

DISTRIBUTIONS OF AEROSOLS IN SAPPORO IN THE WINTER SEASON. *J. Meteorol. Soc. Japan, 49(1):48-55, Feb. 1971. 6 refs.*

Horizontal and vertical distribution of aerosols in Sapporo were measured with a condensation nucleus counter in the winter of 1970. Night time and day time concentrations of aerosols in the city were 10,000/cu cm and 100,000/cu cm, respectively. In the suburbs, the concentration was 1000/cu cm during both day and night Polluted city air was transported far to the leeward by surface winds. Times of peak aerosol concentrations coincided with periods of sunshine and with increases in temperature and wind speed. Except near ground level, aerosol concentrations in lower layers decreased rapidly after snowstorms. Snow crystals not only wash out polluted air but replace the polluted air with fresh air.

11671 APTIC NO. 28983

Hilst, Glenn R. and Norman E. Bowne

DIFFUSION OF AEROSOLS RELEASED UPWIND OF AN URBAN COMPLEX. *Environ. Sci. Technol., 5(4):327-333, April 1971. 3 refs.*

The results of a field program to measure the dispersion of a tracer material in the vicinity of an isolated urban area are described. Tracer material released as an aerial line source was sampled at 250 surface sites and by vertical arrays on one 700-ft tower and on a 1500-ft balloon tether. The enhanced surface roughness and thermal mixing caused by the city produced a 30-50% increase in the vertical mixing of the aerosol over the city as compared with adjacent rural pattern in an urban area. The centerline (axis of maximum concentration) of the vertical profile of the tracer cloud appeared to be translated to the ground at a rate governed by the vertical temperature structure of the rural atmosphere. Average surface dosage patterns suggest a cellular or helical motion in the wind field near the city. (Author abstract)

11672 APTIC NO. 29006

Dyer, A. J.

VOLCANIC DUST IN THE NORTHERN HEMISPHERE. *J. Geophys. Res., 76(12):2898-2899, April 20, 1971. 5 refs. Includes reply by (Frederic E. Volz.)*

The question of increased turbidity of the stratospheric aerosol layer of the northern hemisphere after the eruption of the Agung volcano in 1963 is debated. In particular, pyrheliometric data (for the northern hemisphere) are evaluated as to whether they indicate seasonal variations in the dustiness of stratosphere.

11673 APTIC NO. 29009

Wojciechowski, K.

THE DEPOSITION OF DUST PARTICLES FROM ELEVATED SOURCES AND THE VERTICAL WIND PROFILE. *Atmos. Environ., 5(1):41-48, Jan. 1971. 14 refs.*

The influence of the vertical wind profile on dust deposition from an elevated source was investigated. Some new formulae are compared with those derived by Sutton and Krieb. From the comparison it appears that formulae taking into account the vertical wind profile give a better picture of dust deposition than those based on the assumption that wind velocity is independent of stack height. (Author abstract modified)

11674 APTIC NO. 29025

Engelmann, Rudolf J.

SCAVENGING PREDICTION USING RATIOS OF CONCENTRATIONS IN AIR AND PRECIPITATION. *Atomic Energy Commission, Washington, D. C., Fallout Studies Branch and Battelle Memorial Inst., Richland, Wash. Pacific Northwest Lab. Precipitation Scavenging Proc. Symp., Richland, Wash., 1970, p. 475-485. 21 refs. (June 2-4.)*

Data are presented which demonstrate that washout ratios are applicable to the prediction of scavenging by precipitation of widely varying particle sizes and even, perhaps, of gases. The explanation offered is compatible with observed variations of pollutant concentration in rain with rainfall rate and dew point, with the consistency of observed ratios, and with an elementary equation that is derived to explain the ratios. (Author abstract)

11675 APTIC NO. 29026

Kortzeborn, Robert N. and Farid F. Abraham

SCAVENGING OF AEROSOLS BY RAIN: A NUMERICAL STUDY. *Atomic Energy Commission, Washington, D. C., Fallout Studies Branch and Battelle Memorial Inst., Richland, Wash., Pacific Northwest Lab., Precipitation Scavenging Proc. Symp., Richland, Wash., 1970, p. 433-446. 23 refs. (June 2-4.)*

Scavenging below the cloud level by falling raindrops is considered Previously published models of washout have assumed that the raindrop size distribution and the atmospheric conditions are identical at the ground and at the cloud base and do not vary with time. The present model allows a spatially varying atmospheric profile and takes evaporation and coalescence of raindrops into account on a dynamic basis. These effects greatly alter washout at low elevations. The computational model is explained in detail. (Author abstract modified)

11676 APTIC NO. 29032

Bownds, John M.

THE FORMULATION OF EMISSION CONTROL STRATEGIES USING A CUBIC POLYNOMIAL APPROXIMATION. *J. Air Pollution Control Assoc., 21(4):210-213, April 1971. 5 refs.*

A description is presented of a polynomial approximation technique which, when used in conjunction with a diffusion model, should be of considerable value in determining acceptable emission levels for point sources. The method appears to give planners a broad range of choices for control strategies. The technique is illustrated by application to a situation where there are two point sources in the solid waste disposal category, two in the industrial process category, and one in the fuel consumption category.

11677 APTIC NO. 29033

Ette, A. I. I.

THE EFFECT OF THE HARMATTAN DUST ON ATMOSPHERIC ELECTRIC PARAMETERS. *J. Atmospheric Terrest. Phys., 33(2):295-300, 1971. 16 refs.*

Between November and March, most of West Africa is under the influence of dry ENE Harmattan winds which blow southward from the Sahara desert, filling the air with large concentrations of fine dust, whose major constitutent is silica. Within the Harmattan climatic zone, simultaneous reversals of the fair-weather values of the vertical air-earth current and the atmospheric potential gradient are common around noon. A complete reversal of the normal values is often accomplished within about 10 min. This problem is re-examined in terms of electrification of dust clouds, the diurnal electrification process, and the effects of wind speed. It is proposed that the reversals are due to the production of large negative charges through dust dispersal in the dry Harmattan atmosphere by convection and wind, both of which attain maximum strength around noon.

11678 APTIC NO. 29071

Sakai Municipal Office (Japan), Dept. of Countermeasure for Public Nuisance

SAKAI CITY AIR POLLUTION RESEARCH REPORT. 1969 FISCAL YEAR. *(Sakaishi taikiosen chosa hokoku. Showa 44 nendo). Text in Japanese. 252p., 1970.*

Sulfur dioxide, falling dust, and floating dust were observed for a year in order to study the relation between air pollution and wind direction and velocity. Sulfur dioxide was measured by two methods giving different results: the lead dioxide method showed that sulfur dioxide concentration increases year by year (average value in 1969: 1.49 mg/day/100 sq cm), while the electrical conductivity method showed a decrease (average value in 1969: 0.023-0.047 ppm). The fuchsin formaline method was used to test the accuracy of the measurement equipment; it proved that the automatic measurer of electric conductivity had an error caused by the presence of hydrogen peroxide in the absorption solution. Also, weather conditions varied the result. Pollution by SO2 occurs chiefly from a north wind. When wind velocity fell below 3 m/sec, the SO2 concentration was higher with the north wind, while above 3.1 m/sec it was higher with the west wind. Pollution by floating dust occurred below 3 m/sec with the east wind. Because of these variations in results it is important to take a wind view of result obtained from various methods.

11679 APTIC NO. 29076

Galbally, I. E.

SURFACE OZONE OBSERVATIONS AT ASPENDALE, VICTORIA, 1964-1970. *Atmos. Environ., 5(1):15-25, Jan. 1971. 20 refs.*

Five years of observations of the ozone concentration in the surface air at Aspendale, Australia (a Melbourne suburb) are presented. Most of the ozone observed at the surface can be explained as ozone of stratospheric origin. On some occasions, however, ozone concentrations reached 0.1 ppm v/v, a level that cannot be explained by ozone transport down the mixing ratio gradient. The additional ozone amount is probably the result of local production of ozone near the earth's surface by photochemical air pollution reactions. The high concentations are noted to be associated with high air temperatures and reduced intensity of ultraviolet radiation observed at the earth's surface.

11680 APTIC NO. 29090

Wigley, T. M. L. and P. R. Slawson

ON THE CONDENSATION OF BUOYANT, MOIST, BENT-OVER PLUMES. *J. Appl. Meteorol., 10(2):253-259, April 1971. 6 refs.*

The theory of growth of dry plumes is extended to include the effects of moisture in both the vapor and liquid forms. A relation determining the point at which a moist plume first condenses is derived. Numerical solutions of this relation indicate that, under most atmospheric conditions, condensation either occurs very close to the stack or not at all. A method for predicting whether or not condensation will occur for arbitrary conditions of atmospheric relative humidity and initial temperature excess and relative humidity of the plume is given. The special case where the plume is initially saturated, corresponding to cooling tower effluents, is considered in detail. (Author abstract)

11681 APTIC NO. 29093

Shimizu

THE INTERACTION BETWEEN RADIOACTIVE IONS AND CONDENSATION NUCLEI. *J. Meteorol. Soc. Japan, 48(1):69-76, Feb. 28, 1970. 12 refs.*

To clarify the interaction between radioactive ions and condensation nuclei, simultaneous measurments of the concentrations of radioactive ions, radioactive aerosols, condensation nuclei, and small positive ions were carried out on the top of Mt. Noirkura (2770 m) and the campus of Nagoya University. The mean life of radioactive ions is 38 sec on top of the mountain and 14 sec on the campus. The concentration of radioactive ions correlates positively with that of small positive ions and negatively with that of condensation nuclei. Simple formulae are derived for expressing these correlations. (Author abstract modified)

11682 APTIC NO. 29099

Junge, C., W. Seiler, and P. Warneck

THE ATMOSPHERIC CO (12) AND CO (14) BUDGET. *J. Geophys. Res., 76(12):2866-2879, April 20, 1971. 24 refs.*

The budget of carbon monoxide in the atmosphere is discussed. For CO(12) the known sources are anthropogenic emission and production by the oceans. The magnitude of the latter source is derived for the northern hemisphere from measurements of CO concentrations over the Atlantic and Pacific Oceans. The destruction of CO(14) occurs in the stratosphere and by a tropospheric sink of unkonwn nature. The anthropogenic and maritime CO sources do not contribute significantly to the production of CO (14) that occurs mainly by cosmic radiation. A model is presented for the budgets of CL(14) and CO(12) in the atmosphere. The model, which treats the tropospheric and stratospheric domains separately, permits the flux of CO(14) across the tropopause to be calculated. The results provide the magnitude of the tropospheric sink as a function of the tropospheric CO(14) concentration and enable a comparison of the CO(14) and CO(12) residence times in the troposphere. If the tropospheric CO(14) value is derived from the measurements of McKay et al (1969), the residence times of CO(14) and CO(12) are both approximately 0.2 yr. It is argued, however, that the CO(12) residence time is probably about 1 yr. (Author abstract modified)

11683 APTIC NO. 29101

Cox, C. S.

AEROSOL SURVIVAL OF PASTEURELLA TULARENSIS DISSEMINATED FROM THE WET AND DRY STATES. *Appl. Microbiol., 21(3):482-486, March 1971. 17 refs.*

Aerosol survival in air and nitrogen was measured for Pasteurella tularensis live vaccine strain, disseminated from the wet and dry states. The results showed that most of the loss of viability occurred in less than two min of aerosol age, i.e., a rapid initial decay followed by a much slower secondary decay. In nitrogen and air, minimum survival occurred at 50-55% relative humidity (RH) for wet dissemination and 75% RH for dry dissemination. This shift indicates that aerosols produced by wet and dry dissemination are not equivalent and suggests that survival might be unrelated to bacterial water activity or content. The results also show that rehydration is the key process with regard to survival, although lysis on rehydration is not a primary death mechanism. Depending on other conditions, the effects of oxygen were protective or toxic. The protective action of oxygen was observed on spent culture-suspending fluid; the latter contained a toxic compound whose activity was suppressed by oxygen. A toxic effect of oxygen was not found in the presence of spent culture media because the toxicity of the latter masks such an effect. With other bacterial suspending fluids, oxygen was toxic at low RH. Similar effect with regard to oxygen toxicity were also found with a laboratory strain of P. tularensis. Differences in oxygen toxicity for aerosols generated from the wet and dry states also imply that bacterial water content and activity do not control aerosol survival. (Author abstract modified)

11684 APTIC NO. 29103

Beilke, S.

LABORATORY INVESTIGATIONS ON WASHOUT OF TRACE GASES. *Atomic Energy Commission, Washington, D. C., Fallout Studies Branch and Battelle Memorial Inst., Richland, Wash., Pacific Northwest Lab., Precipitation Scavenging Proc. Symp. Richland, Wash., 1970, p. 261-269. 5 refs. (June 2-4.)*

Laboratory investigations on the washout of sulfur dioxide, nitrogen dioxide, and carbon dioxide are reported. The tests were made in a cylinderlike container with a volume of about 1 cu m. This chamber was filled with a gas mixture containing the trace gas, and when the desired trace gas concentration was reached, a continuous rain was generated within the chamber. During this artificial rain the trace gas was washed out, and the concentration, measured by recording instruments, was decreased. SO2 was measured by a change in electricl conductivity, NO2 by colorimetry, and CO2 with an infrared absorption spectrometer. The order of magnitude of trace gas washout coefficients was determined, and the reasons for different washout behavior of these three gases are explored.

11685 APTIC NO. 29105

Hocking, L. M.

RECENT CALCULATIONS OF COLLISION EFFICIENCIES. *Atomic Energy Commission, Washington, D. C., Fallout Studies Branch and Battelle Memorial Inst., Richland, Wash., Pacific Northwest Lab., Precipitation Scavenging Proc. Symp., Richland, Wash., 1970, p. 381-383. 2 refs. (June 2-4.)*

Small particles collide when there is an approach mechanism to bring them together and an adhesion mechanism to prevent them from being separated. There are two sets of calculations to determine collision efficiency; each set uses different approach mechanisms and different adhesion characteristics. The first set of calculations concerns collisions between drops of unequal size falling in still air, while the second set of calculations relates to the motions of solid particles in a shear flow. A further possibility is the scavenging of aerosol particles during the motion of two cloud droplets in near contact. (Author abstract modified)

11686 APTIC NO. 29111

Holzman, B. G. and H. C. S. Thom

THE LA PORTE PRECIPITATION ANOMALY. *Bull. Am. Meteorol. Soc., 51(4):335-337, April 1970. 4 refs.*

The average annual precipitation reported at La Porte, Ind., in the period 1927-1963 was more than 11 in. higher than in the period 1898-1926 and more than 7 in. higher than in the period 1964-1968. This precipitation record has been widely cited as evidence of a possible effect of air pollution on downwid precipitation and severe storm activity. However, a fresh examination of the record shows that it is statistically invalid and physically unacceptable. The dates of the abrupt appearance and disappearance of the precipitation anomaly at La Porte closely coincide with a change of observer and station location in 1927 and with a change in procedure for reporting precipitation in 1964. Moreover, no appreciable trend in total precipitation can be detected in the 37-yr period between these dates.

11687 APTIC NO. 29117

Hidy, G. M.

THEORY OF DIFFUSIVE AND IMPACTIVE SCATTERING. *Atomic Energy Commission, Washington, D. C., Fallout Studies Branch and Battelle Memorial Inst., Richland, Wash., Pacific Northwest Lab., Proc. Symp., Richland, Wash., 1970, p. 355-371. 9 refs. (June 2-4.)*

Recent developments in a kinetic theory of hard-sphere aerosols are reviewed with particular emphasis on microphysical and microchemical processes involved in scavenging of gases and particles by rain clouds. Of particular interst are such topics as gas and particle diffusion to cloud and rain droplets, inertial deposition of particles on droplets, the role of rarefied gas effects in such dynamical processes, the consequences of diffusiophoretic and thermal forces acting on aerosols near water droplets, removal of gases by homogeneous chemical reactions to form aerosols, chemical reactions inside and at the surface of droplets, and collision and coagulation of droplets and aerosols. It is suggested that elements of the idealized theory should provide a framework within which experiments may be interpreted or checked for consistency. Disagreement between theory and observation may point either to systematic experimental error or to poorly understood phenomena significant in the scavenging process. (Author abstract)

11688 APTIC NO. 29118

Reiquam, H.

EUROPEAN INTEREST IN ACIDIC PRECIPITATION: A REVIEW. *Atomic Energy Commission, Washington, D. C., Fallout Studies Branch and Battelle Memorial Inst., Richland, Wash., Pacific Northwest Lab., Precipitation Scavenging Proc. Symp., Richland, Wash., 1970, p. 289-292. (June 2-4.)*

There is increasing concern, particularly in Scandinavia, over the long-range transport of air pollutants. Although hard data for verification are not available, there is circumstantial evidence that sulfur dioxide emitted in industrialized nations, such as Great Britain and West Germany, contributes to the acidity of preciptation far downwind. Some of that evidence is reviewed. Among the problems associated with this question are poor understanding of the reactions, reaction rates, and removal mechanisms, which determine the residence time of pollutants, and the lack of current data on air and precipitation chemistry worldwide. (Author abstract)

11689 APTIC NO. 29119

Cole, John E., III and Richard A. Dobbins

MEASUREMENTS OF THE ATTENUATION OF SOUND BY A WARM AIR FOG. *J. Atmos. Sci., 28(2):202-209, March 1971. 14 refs.*

Measurements of sound attentuation by a warm air fog are presented for dimensionless frequencies, WT t/Cm where Tt is the thermal relaxation time for the droplet, W the circular acoustic frequency and Cm the liquid mass fraction, near unity where the effects of mass transfer are dominant. The tests were made in a Wilson cloud chamber by measuring the rate of decay of the fundamental mode of acoustic oscillation which is excited during the operation of the chamber. Measurements of pressure and volume are made continuously during the expansion. Droplet size and concentration of the monodisperse fog are determined from time resolved measurements of the optical transmission at two wavelengths of light. The range of WTt/Cm from 0.5-16 is scanned by varying droplet size and concentration through the controlled addition of condensation nuclei. This range includes the Napier frequency (frequency for which attentuation per unit wavelength is maximum)m and the resulting data indicate that a maximum dimensionless attentuation occurs for a value of WTt/Cm approximately 1, as predicted by the theory of Cole and Dobbins. The magnitude of the maximum dimensionless attentuation is approximately 100 times that which would be obtained for a corresponding nonvolatile aerosol. (Author abstract)

11690 APTIC NO. 29122

Slinn, W. G. N. and J. M. Hales

PHORETIC PROCESSES IN SCAVENGING. *Atomic Energy Commission, Washington, D. C., Fallout Studies Branch and Battelle Memorial Inst., Richland, Wash., Pacific Northwest Lab., Precipitation Scavenging Proc. Symp., Richland, Wash., 1970, p. 411-422. 18 refs. (June 2-4.)*

A comparison is made of the roles played by thermophoresis, Brownian diffusion, and diffusiophoresis in the precipitation scavenging of aerosol particles. It is shown that for a certain range of particle sizes, thermophoresis dominates if the latent heat associated with the phase transition of water is transferred through the air to or from the precipitation element by conduction. A graph of the resulting washout coefficient shows that thermophoresis enhances the below-cloud rain scavenging of aerosol particles with radii between 0.01 and 1.0 micron. The solution is presented for the appropriate convective-diffusion equation that describes thermophoretic effects in the in-cloud scavenging problem. (Author abstract)

11691 APTIC NO. 29124

Robbins, John A.

MODEL FOR VARIATIONS WITH PARTICLE SIZE OF HALOGEN-ION RATIOS IN MARINE ATMOSPHERES. *Atomic Energy Commission, Washington, D. C., Fallout Studies Branch and Battelle Memorial Inst., Richland, Wash., Pacific Northwest Lab., Precipitation Scavenging Proc. Symp., Richland, Wash., 1970, p. 325-351. 27 refs. (June 2-4.)*

A mathematical model has been formulated to account for published chemical analyses of marine aerosol size fractions for iodine, bromine, and chlorine. The model assumes that iodine vapor is gained and bromine vapor is lost by particles at rates determined by gaseous diffusion around the particle. Both iodine and bromine may saturate a particle surface layer, although the detailed mechanism of saturation is not crucial to the model. By nonlinear least-squares fitting to observed data points, the model satisfactorily accounts for a decrease in the I/Cl ratio with increasing radius as r to the second power for larger unsaturated particles and as r for smaller saturated particles, and the former shows an inverse dependence on wind speed. The model accounts for the observed minimum in Br/Cl ratio for intermediate size fractions and the inverse dependence of its depth on wind speed. The model requires that most of the aerosol mass sampled is derived from a fairly narrow band of particle ages in order to account for the observed composition variation with size fraction, and this assumption provides an explanation for dependence on wind speed. Among the specific questions raised in this mathematical study which may be tested experimentally are the band width of aerosol particle ages with wind speed and sampling location, the chemistry of iodine and bromine retention by particles, and the mechanism of bromine loss from particles. (Author abstract)

11692 APTIC NO. 29125

Gatz, Donald F. and A. Nelson Dingle

TRACE SUBSTANCES IN RAIN WATER: CONCENTRATION VARIATIONS DURING CONVECTIVE RAINS, AND THEIR INTERPRETATION. *Tellus (Upsalla), 23(1):14-27, 1971. 33 refs.*

Trace anlaysis (for pollen and radioactivity) of sequential rain samples showed that marked concentration variations in convective rains are clearly produced by individual shower cells. The concentration time profile is quite distinctive. Most commonly, the concentration peak occurs early in the shower, but the time intervals between the maxima of rainfall rate and concentration appears to vary continuously when a number of showers is studied. This suggests that 'direct' and 'inverse' relationships between concentration time profile and rainfall rate time profiles are not necessarily produced by different kinds of processes. Concentration variations in rain observed at a fixed point can be viewed as the sum of (1) individual changes within moving rain parcels and (2) horizontal and vertical advection of concentration gradients in the three-dimensional rain field. The data support the idea that early precipitation of the largest and most favored nuclei produces high concentrations early in showers and low concentrations in the heaviest rain. In the case of persistent severe storms, the much deeper downdraft leads to a greater water loss by evaporation and higher-than-usual concentrations in the heaviest part of the rain. (Author summary modified)

11693 APTIC NO. 29141

WORLDWIDE ENVIRONMENTAL POLLUTION. *(Weltweite Umweltverschmutzung) Text in German. Umschau (Berlin), 71(9):305-308, 1971.*

The carbon dioxide content of the atmosphere has gradually risen from 306/ppm in 1950 to 321/ppm in 1970. It is predicted to rise to 379 ppm by 2000. The average annual increase in atmospheric CO2 is 0.8 ppm. How much of the increasing CO2 emission can be swallowed by the biosphere and the oceans cannot be estimated at this time. If the CO2 concentration doubles over the next decade, it would raise the temperature on the earth by 2 C which could have dire consequences. Aerosols in the atmosphere may also influence the heat balance of the earth; they raise the temperature in the stratosphere. The particles also serve as condensation nuclei for water vapor and promote cloud formation. There are many indications that the atmosphere has become cloudier over the last three decades. This is mostly due to the increasing air pollution over cities. Moreover, measurements in Davos indicated a global increase in aerosol concentration. Investigations on the decreasing oxygen content of the atmosphere due to combustion of fossil fuels have shown that there is no imminent danger of a lack of oxygen.

11694 APTIC NO. 29142

Chamberlain, A. C.

DEPOSITION AND UPTAKE BY CATTLE OF AIRBORNE PARTICLES. *Nature, 225(5227):99-100, Jan. 3, 1970. 16 refs.*

On the assumption that the total wet plus dry deposition rate is 1000 m/day, the amounts of radioactive aerosols deposited on herbage and ingested and inhaled by cattle are calculated. In addition, data are given for the amount of I(131) inhaled and ingested by cattle following the Windscale accident. The ingestion route is noted to be 800 times as effective as the inhalation route for uptake of iodine. Also presented is a comparison of wet and dr deposition from aerosols that have travelled long distances and those that have travelled short distances. At short distances, wet deposition is relatively ineffective because the height of the aerosol cloud is smaller and there is less chance of the aerosol entering cloud droplets.

11695 APTIC NO. 29151

Ogawa, Hiroshi, Katsumi Yoshida, Masayoshi Kitabatake, and Seiro Kimura

CALCULATION OF DIFFUSION USING PASQUILL FORMULA. *(Pasquill shiki ni yoru kakusen keisanrei nitsuite). Text in Japanese. Taiki Osen Kenkyu (J. Japan Soc. Air Pollution), 5(1) 118, 1970. (Proceedings of the Japan Society of Air Pollution, Annual Meeting, 11th, 1970.)*

Average air pollution concentration was calculated on the basis of weather, cloud amount, wind direction, and wind speed. The methods of computation were as follows: Holland's equation for effective stack height, the British Meteorological Agency method for diffusion equation, and Pasquill's classification for stability. The Pasquill classification requires solar radiation data; since this is not always available, it was estimated from the cloud amount by first establishing the relationship between the seasonal and hourly weather and solar radiation. That relationship could be described as a linear equation. Wind speed and direction and stability frequency were extractef from the annual data obtained at Yokkaichi. An equation estimaing the average concentation, at point A, of the smoke emitted from a compound stack is given. The results obtained by the above calculation method were compared to the actual concentrations observed at Yokkaichi and Tokai.

11696 APTIC NO. 29158

Collins, George F.

CONSEQUENCES OF EFFLUENT RELEASE: PREDICTING SEA-BREEZE FUMIGATION FROM TALL STACKS AT COASTAL LOCATIONS. *Nucl. Safety, 12(2):110-114, March/April 1971. 1 ref.*

A method of predicting the transport distance required to complete the transition from overwater to overland diffusion as a function of plume height, wind speed,, and vertical temperature profile was suggested by Van der Hoven in 1967. During the summer of 1969, field studies were conducted on the shores off Cape Cod Bay to determine if the method could be modified for irregular terrain to serve as a reliable predictor mixing depth. On seven occasions smoke was released from a meteorological tower during onshore winds. Simultaneously, initial stability was measured indirectly from tower temperature a and sea-surface temperatures. For six tests the point of interception with mixing layer predicted by the Van der Hoven method was within 10% of observed points. The exception to this trend was one test where predicted mixing depth was within 20% of that observed. It is concluded that Van der Hoven's technique, modified for terrain effects, provides a reliable sea-breeze fumigation tool if initial overwater stability is known.

11697 APTIC NO. 29164

Aburamoto, Yukio, T. Tada, and Yasushi Ogawa

THE EXPERIMENT IN WIND TUNNEL THE CONCENTRATION BEHIND THE BUILDING. *(Fudo jikken. Tatemono haigo no nodo bunpu). Text in Japanese. Taiki Osen Kenkyu (J. Japan Soc. Air Pollution), 5(1):121, 1970. (Proceedings of the Japan Society of Air Pollution Annual Meeting, 11th, 1970.)*

A wind tunnel was used to study the structure of air pollution behind a building. In the wind tunnel, the building was represented by a vertical board; wind speed distribution, flow line, and turbidity intensity were investigated by means of a type-X heat ray anemometer. The concentration of the experimental pollutant was measured by a hydrocarbon analyzer. Wind speed distribution, flow line and turbulence intensity, and concentration distribution are graphically represented.

11698 APTIC NO. 29167

Drake, R. L.

PROCESSES INFLUENCING EVOLUTION OF DROPLET OR AEROSOL SPECTRUM. *Atomic Energy Commission, Washington, D. C., Fallout Studies Branch and Battelle Memorial Inst., Richland, Wash., Pacific Northwest Lab., Precipitation Scavenging Proc., Symp., Richland, Wash., 1970, p. 385-402. 45 refs. (June 2-4.)*

The state of the art of the scalar transport equation that arises in the study of an evolving size spectrum of aerosol particles or cloud water droplets is reviewed. The mathematical system investigated is an integrodifferential equation that contains terms accounting for coagulation or coalescence of particles, particle breakup, sedimentation of particles, particle scavenging, and droplet production due to condensation. Various theoretical developments, numerical models, and other approximate methods are included. Also considered are results concerning the upper and lower bounds of the power moments of the particle distribution and how these results affect the choice of the collection kernel in the integrodifferential equation. Ideas concerning the numerical solution of the coalescence equation by the method of perturbing the kernel and by similarity approximation are given. (Author abstract modified)

11699 APTIC NO. 29168

Hales, J. M., J. M. Thorp, and M. A. Wolf

WASHOUT OF SO2 FROM THE PLUME OF A COAL-FIRED POWER PLANT. *Atomic Energy Commission, Washington, D. C., Fallout Studies Branch and Battelle Memorial Inst., Richland, Wash., Pacific Northwest Lab., Precipitation Scavenging Proc Symp. Richland, Wash., 1970, p. 293-303. 5 refs. (June 2-4.)*

Recent field measurements of washout by rain and snow of sulfur dioxide in plumes from the 800-ft stacks at the world's largest mine-mouth electric power generating plant demonstrate some complexities arising from the interaction of meteorological and physicochemical factors. Recognized vertical shear of the buoyant plume is difficult to document and evaluate, and little attention has been given yet to the probability of in-cloud scavenging when cloud bases are low. Nor have the extent and effect of stack and cooling tower plume interaction been examined. (Author abstract modified)

11700 *APTIC NO. 29169*

Sato, Masahiro, Takeo Yamamoto, Kaoru Nishida, and Keitaro Kotera

WIND TUNNEL EXPERIMENT FOR AIR POLLUTION WITH VALLEY MODEL. (Bonchinai osen ni kansuru fudo jikken). Text in Japanese. Taiki Osen Kenkyu (J. Japan Soc. Air Pollution), 5(1):123, 1970. (Proceedings of the Japan Society of Air Pollution, Annual Meeting, 11th, 1970.)

Wind tunnel model experiments were conducted to observe the diffusion of pollution in a basin. Ethane gas was emitted from a point between two sinusoidal hills at the rate of 60 ml/min, and wind was passed over the hills of 3.0 m/sec. The gas sampled inside the basin was analyzed by an infrared analyzer. With the distance between the bottom of the hills W equals 0 cm, high concentrations were observed upwind from the source. With W equals 40 cm, the concentrations were generally under 3 ppm, except at the bottom part upwind from the source where concentration was higher. At W equals 80 cm, ellipsoidal distribution was found upwind and downwind from the source, with high concentrations near the source. At 160 cm, the concentration was higher 10 cm downwind from the source.

11701 APTIC NO. 29170

Ando, Takeo

OBSERVATION AND STUDY OF DIFFUSION OF AUTOMOTIVE EXHAUST GAS IN THE FLAT GROUND BESIDE THE ROAD. *(Jidosha haiki gasu no doro shuhen heitanchi ni okeru kakusan gensho no kansatsu to kosatsu). Text in Japanese. Taiki Osen Kenkyu (J. Japan Soc. Air Pollution), 5(1): 117, 1970. (Proceedings of the Japan Society of Air Pollution, Annual Meeting, 11th, 1970.)*

Air pollution by automobile exhaust gas along a traffic thoroughfar was studied by measuring ground-level concentrations of carbon monoxide. The condition of diffusion of carbon monoxide thus observed was correlated with the traffic condition, the environment along the street, and meteorological conditions. The paper specifically deals with the case of a flat area. The measurements were mainly on horizontal distribution of concentration downwind and at a right-angle direction from the street. Vertical concentration along the street was also studied. Traffic volume was measured by taking a 16 mm movie of the 100-meter stretch of th road every other second. Wind speed and wind direction were also recorded. Reproduceability of the experiment was studied by various operations on the data.

11702 APTIC NO. 29172

Okita, Toshiichi, Shuji Yamashita, Hiromasa Nakagawa, and Shigeru Wakui

DISTRIBUTION OF WEAK WIND OVER ECHIGO PLAIN. PART II. *(Echigo heiya ni okeru jakufuji no kaze no bunpu. II). Text in Japanese. Taiki Osen Kenkyu (J. Japan Soc. Air Pollution), 5(1):109, 1970. (Proceedings of the Japan Society of Air Pollution, Annual Meeting, 11th, 1970.)*

Data from wind speed and wind direction measurements conducted in and around Niigata from January to December 1965 were plotted and analyzed. Classification of various anomalous wind patterns was as follows: wind direction is too complex to be expressed by a set pattern; pattern is divergent; there is vertical flow; a roughly east-west discontinuity appears between south and north winds when one supersedes the other; and stationary discontinuity occurs due to the collision of south and north winds.

11703 APTIC NO. 29173

Fukuoka, Yoshitaka

STUDY ON MOTIONLESS AIR MASS. *(Ugokanu kuki no sonzai ni kansuru yosatsuteki kenkyu). Text in Japanese. Taiki Osen Kenkyu (J. Japan Soc. Air Pollution), 5(1):108, 1970. (Proceedings of the Japan Society of Air Pollution, Annual Meeting, 11th, 1970.)*

A definition of the circulation time of water is: the total amount of water in a certain section of a circulatory system at a certain point in time, divided by the total amount of water that passes through that section in a year. If a similar argument could be made for air in the atmosphere, than for a city, when its total amount of air is divided by the amount of air that crosses one of the city's cross sections in a unit time (v), the air circulation time Vt could be obtained by Vt equals 1/v. If v is very small, then Vt is seen to be infinitely large, representing the stagnant air that causes many problems. In the present investigation, the relationship between the temporal variation and the stability of the atmosphere and the relationship between the horizontal distribution and topology were studied. For the daily variation of the frequency of calm, correspondence with atmospheric stability was seen, especially at night or early morning in winter when calms are very frequent.

11704 APTIC NO. 29174

Sakuraba, Shinichi, Minoru Moriguchi, and Junji Sato

VERTICAL SPREAD OF PLUME IN STABLE LAYERS. *(Anteisochu no enchokunodo haba). Text in Japanese. Taiki Osen Kenkyu (J. Japan Soc. Air Pollution), 5(1):110, 1970. (Proceedings of the Japan Society of Air Pollution, Annual Meeting, 11th, 1970.)*

In the summer of 1969, a diffusion experiment was conducted during monsoon-type weather. Data were obtained inside the isothermal layer under the inversion surface. The vertical distribution of the concentration was measured at points 1.3 and 2.0 m downwind from the source. The height of the source was 100 and 200 m. Collection time was 10 30 min. Sigma-z, the standard deviation in the vertical direction, was the same at the two locations, and there was consequently no increase with distance downwind. To determine how sigma-z varied further away the variation of the central axis height of the concentration with downwind distance was estimatd. At distances over 1.3 km with sigma-z constant, the estimate of the central axis height based on the surface concentration corresponded well to the topology of the ground-surface; it was more rational than the estimate obtained by using sigma-z in the stable layer in the Pasquill diagram. The conclusion is the sigma-z becomes constant beyond a certain distance downwind in the stable layer.

11705 APTIC NO. 29175

Ohta, Yoshio

AIR POLLUTION IN TOYAMA PREFECTURE. *(Toyama Takaoka Shinminato chiku no taiki osen to kisho). Text in Japanese. Taiki Osen Kenkyu (J. Japan Soc. Air Pollution), 5(1):114, 1970. 3 refs. (Proceedings of the Japan Society of Air Pollution, Annual Meeting, 11th, 1970.)*

In Toyama, dusts are measured by digital dustmeters and sulfur dioxide by an electroconductivity method. Furthermore, settling dusts are recorded by means of deposit gauges and sulfur oxides by the lead peroxide method. The Iwase district of Toyama is known to be especially affected by air pollution, ranking first in the country in number of electric furnaces. Sulfur oxides and settling dusts were measured at thirty locations in the area, and their relationship to the meteorological conditions was investigated. Sulfur oxides and dusts were distributed in the direction of the wind, in a belt-like fashion. Even a slight distance made a difference in the concentrations, indicating the effect of wind direction. Smoke showed two peaks in the diurnal record, and SO2 concentration was highest in the morning. High concentrations tended to occur on days with stable temperature.

11706 APTIC NO. 29176

Sakuraba, Shinichi, Minoru Moriguchi, Akira Oshino, and Michio Nakano

SURVEY OF ATMOSPHERIC POLLUTION AT THE WEST-SIDE OF OSAKA CITY. NO. 1 TRACER STUDY OF ATMOSPHERIC DISPERSION. *(Nishi-Osaka chiku taiki osen chosa. Kakusan jikken). Text in Japanese. Taiki Osen Kenkyu (J. Japan Soc. Air Pollution), 5(1):112, 1970. (Proceedings of the Japan Society of Air Pollution, Annual Meeting, 11th, 1970.)*

Diffusion experiments were conducted in the small-to-medium industrial area in Nishi-Osaka during a period of westerly winds. In an area where the distribution of the sources is coarse (?) and where the emission sources are very low, the analysis of diffusion data must be performed with the following in mind: the z-bar, the central axis height of the concentration, varies very rapidly with the distance downwind. Otherwise the standard deviation sigma-z will be completely wrong. On this point, even the well-known analysis of the St. Louis data is doubtful. In the present study, sigma-z was obtained from the vertical distribution of concentration, and Pasquill stability was determined. From the ground surface concentration distribution, the z-bar was found by using the diffusion equation. By comparing the z-bar and the height of the nonlift balloon, the appropriateness of Pasquill stability was determined. Pasquill stability was B to D. At wind speed over 4 m/sec, it was C to D. At high wind speed the Z-bar was small; it was large at low wind speed. Pasquill stability is related to z-bar. When z-bar is small, Pasquill stability is low. Ground-surface concentration (standardized) is low when the z-bar is large.

11707 APTIC NO. 29177

Yoshida, Tsuyoshi

THE DIURNAL VARIATION OF THE POLLUTANT CONCENTRATION IN AN URBAN AREA. *(Toshinbu ni okeru taiki osen nodo no nichikenka ni tsuite). Text in Japanese. Taiki Osen Kenkyu (J. Japan Soc. Air Pollution), 5(1):113, 1970. (Proceedings of the Japan Society of Air Pollution, Annual Meeting, 11th, 1970.)*

Air pollution in Sapporo in winter shows morning and evening concentration peaks. The vertical diffusion coefficient was calculated from the daily variation of the temperature and from boundary conditions at the upper layer. Together with the emission intensity obtained from a boiler investigation, an attempt was made to solve by approximation the diffusion equation. Two-peaked high concentrations were reproduced. The technique essentially involves a set of simultaneous second-order partial differential equations relating wind speed to the vertical distance and temperature gradient to the vertical distance, respectively. Two parameters are involved: KM, the vortex diffusion coefficient of the momentum, and KH, the vortex diffusion coefficient of heat. By approximation methods, KM, which is a function of height and time, is used to approximate the vertical diffusion coefficient KZ. The solution by the relaxation method of the second-order partial differential equation gives the concentration as a function of time and vertical distance, after a proper set of boundary conditions has been chosen.

11708 APTIC NO. 29178

Shiozawa, Kiyoshige, Atsushi Ootaki, and Shinichi Okamoto

ON THE ANALYSIS OF AIR POLLUTANTS BY CANONICAL CORRELATION ANALYSIS-RELATION OF METEOROLOGICAL CONDITION. *(Seijun sokan bunseki ni yoru taiki osen busshitsu no kaiseki - kisho tono kankei). Text in Japanese. Taiki Osen Kenkyu (J. Japan Soc. Air Pollution), 5(1):115, 1970. (Proceedings of the Japan Society of Air Pollution, Annual Meeting, 11th, 1970.)*

Multiple regression analysis was performed on a matrix of meteorological data and air pollution data for Tokyo. The air pollution data covered concentrations of nitrogen dioxide, nitric oxide, carbon monoxide sulfur dioxide, and suspended particulates. Meteorological data were atmospheric pressure at sea surface, temperature, vapor pressure, relative humidity, wind speed and velocity, cloud amount, present temperature, rainfall, and visibility. With respect to the relationship between the winter pressure patterns and air pollutant concentration, pollution becomes stationary and concentration increases when the migratory anticyclone is in transit or when the trough of atmospheric pressure is in transit. The pollution will be dissipated when the pressure pattern is the typical winter-type west-high and east-low and the pressure variation is the largest between lat 30-40 n and long 135-145 E, or when the cyclone passes by as it develops along the southern coast, or immediately after the transit of a front.

11709 APTIC NO. 29179

Saito, Takayuki, S. Isobe, Yoshinori Nagai, and Yoshiko Horibe

CALCULATION OF AMOUNT OF TRANSPORT OF SO2 GASES TO CROP FIELD BY AERODYNAMIC METHOD. *(Kuryokuho hi yoru hojo eno SO2 gasu no fuchakuryo no suite). Text in Japanese. Taiki Osen Kenkyu (J. Japan Soc. Air Pollution), 5(1):116, 1970. (Proceedings of the Japan Society of Air Pollution, Annual Meeting, 11th, 1970.)*

Aerodynamic techniques were used to calculate the amount of sulfur dioxide gas adhering to grass growing in a wide-open area. The SO2 originates from an iron production plant. Wind speed, vertical distribution of temperature, and hourly variation of SO2 concentration were measured. An equation was derived for the amount of SO2 on the grass surfaces. It depends on the SO2 concentrations at two altitudes, 50 and 200 cm, and the vertical diffusion coefficient. Depending on wind direction, SO2 concentrations were quite different for the two altitudes and for the grasses. The amount of SO2 downward transported to grass surfaces was calculated for different times of day.

11710 APTIC NO. 29180

Yamamoto, Takeo and Kaoru Nishida

A TRIAL ON THE SIMPLIFICATION OF THE ATMOSPHERIC DIFFUSION FORMULA. *(Taiki osen butsu no kakusan shiki ni kansuru ichikosatsu). Text in Japanese. Taiki Osen Kenkyu (J. Japan Soc. Air Pollu-*

tion), 5(1):122, 1970. (Proceedings of the Japan Society of Air Pollution, Annual Meeting, 11th, 1970.)

A simplified formula, based on wind direction and wind speed data for calculating the diffusion of air pollutants was evaluated. For a continuous point source the equation assumes that pollutants are distributed normally in horizontal as well as vertical directions with certain standard deviations, that average wind speed U and the emission speed Q are constant, and that pollutants experience complete reflection at the ground surface. Based on these assumptions, the concentration distribution Chi can be expressed as an exponential function. The variances in the vertical and down-wind directions can be expressed as integrals of Lagrange correlations, which, according to Pasquill et. al., can be estimated by Euler correlations. Euler correlations in turn can be estimated as empirical equations based on wind-tunnel experiments. As a result, the variance in the downwind direction divided by the square of the turbulent flow velocity in the same direction can be expressed as a function of time T and parameter beta-tE. Based on field data, the plots of the variance against T equals U would give estimates of beta-tE so that the original diffusion equation can be used to calculate the concentration.

11711 APTIC NO. 29182

Martens, Christopher S. and Robert C. Harriss

MECHANISMS OF IODINE INJECTION FROM THE SEA SURFACE. *Atomic Energy Commission, Washington, D. C., Fallout Studies Branch and Battelle Memorial Inst., Richland, Wash., Pacific Northwest Lab., Precipitation Scavenging Proc. Symp., Richland, Wash., 1970, p. 319-324. 4 refs. (June 2-4.)*

Experimental studies indicate that the total flux of iodine into the marine atmosphere is controlled by sea surface temperature, ultaaviolet light, and bubbling, with temperature being more important than ultraviolet light. One millicurie of gamma emitting I-131 in the form of sodium iodide was used as the tracer to determine relative amounts of iodine coming off an artificial sea surface. These experiments have supported the hypothesis of Duce, Woodcock, and Moyers that gaseous iodine is sorbed by aerosols in the atmosphere with relative enrichment being a function of aerosol surface area. Ultraviolet light approximating natural conditions increases the injection rate of iodine into the atmosphere by 50% over temperature controlled injection. (Author abstract modified)

11712 APTIC NO. 29219

Nakano, Michio

AIR POLLUTION OVER LARGE AREA AND METEOROLOGICAL CONDITIONS. *(Koiki taiki osen to kisho). Text in Japanese. Kogai to Taisaku (J. Pollution Control), 7(3):205-212, March 1971. 9 refs.*

Concentrations of air pollutants in the Osaka region were studied in relation to area weather conditions, with the hope that weather patterns would be detected for the prediction of smog and pollution episodes. Diagrams of the realtionship between wind velocity, sulfur dioxide concentration, and suspended dust indicate that concentrations increased when the wind velocity was less than 2 m/sec. Two cases of sustained high-density air pollution which took place during 1970 were analyzed in terms of the weather conditions recorded for those days. The behavior of atmospheric pressure during pollution episodes is mentioned. The high-density smog of Dec. 16-18, 1970, occurred when a comparatively high atmospheric pressure hovered over all of Japan, slowly moving eastward.

11713 APTIC NO. 29223

Saxena, P. P.

ESTIMATION OF ATOMIC NITROGEN AND NITRIC OXIDE IN THE NIGHT-TIME ATMOSPHERE IN THE ALTITUDE REGION 80-110 KMS AND THEIR CONTRIBUTION TO THE NIGHTAIRGLOW CONTINUUM. *Ann. Geophys., 26(3):771-776, July-Aug.-Sept. 1970. 23 refs.*

Production and loss mechanisms of atomic nitrogen and nitric oxide were investigated in the 80-110 km region of the night-time atmosphere. The night-time density profile of the singlet molecule was derived for this region of altitude, and the importance of the reaction between atomic nitrogen and singlet oxygen to yield nitric oxide is discussed. A maximum of 1.75 times 10 to the 7th power NO molecules per cc was computed at 100 km. Using night-time NO-densities, the chemiluminescent reaction between NO and atomic oxygen is discussed for the production of the yellow- green spectral region of the nightairglow continuum. (Author abstract)

11714 APTIC NO. 29232

Nemoto, Junkichi

METEOROLOGICAL ASPECTS OF AIR POLLUTION. *(Osen to kishokenka). Text in Japanese. Kogai to Taisaku (J. Pollution Control), 7(3):199-203, March 1971.*

Global meteorological effects of air pollution are discussed. The hothouse effect pertains to an increase in the temperature with an increase of atmospheric carbon dioxide due to the consumption of fossil fuels. According to some estimates, the atmospheric concentration of CO2 has increased from 290 ppm in the mid-19th century to 320 ppm today. The average rise in temperature is estimated at 0.5 deg for an 18% increase of CO2. Sources of dust in the atmosphere include volcanic activity, automobile emissions, and factory discharges. Volcanic activity appears to result in lower atmospheric temperatures. When Krakatoa erupted in 1883, Japan recorded the lowest average temperatures that summer. Volcanic ash dispersed in the atmosphere prevents solar radiation from directly reaching the earth. However, rather than a sharp curve, recent data on the diffraction of sunlight show a gradual decrease. This may be caused by submicron aerosol particles which remain in the atmosphere much longer than volcanic ash. Effects of water pollution on meteorological conditions are also mentioned. Evaporation may be suppressed if the surface of the sea is covered with oil, and thus interfere with heat transfer and cause a rise in the surface temperature of the sea. Other possible effects of an oil membrane on the sea surface are indicated.

11715 APTIC NO. 29237

Fuwa, Eikichi

AIR STREAM IN HANSIN DISTRICT. *(Hanshin chiho no kiryu ni tsuite). Text in Japanese. Taiki Osen Kenkyu (J. Japan Soc. Air Pollution), 5(1):105, 1970. (Proceedings of the Japan Society of Air Pollution, Annual Meeting, 11th, 1970.)*

Airstreams in the Hanshin area were investigated for over three years by Hyogo and Osaka Prefectures. An example is given for various altitudes, ranging from ground level to 1000 m for January 18, 1969. In general, the airstreams in the Hanshin area can be described as predominantly influenced by the Rokko and Ikoma mountain ranges. The Rokkos separate the northern and the southern air currents, and tend to create a discontinuity along the northeastern part of Osaka. The

Ikomas create currents along the foothills and vortical currents above 350 m. The wind-direction discontinuities tend not to occur around the south of Yamato River or to the north of Osaka Prefecture, but occur around Yodo River. Air currents are complex in the morning, but after 10 am the streams tend to be fairly uniform. High concentrations of pollution seem to occur around the discontinuitie of wind directions.

11716 APTIC NO. 29239

Vittori, Ottavio A. and Vittorio Prodi

PARTICLE-FREE SPACE IN STEFAN FLOW. *Atomic Energy Commission, Washington, D. C., Fallout studies Branch and Battelle Memorial Inst., Richland Wash., Pacific Northwest Lab., Precipitation Scavenging Proc. Symp., Richland Wash., 1970, p. 403-410. 9 refs. (June 2-4.)*

Sources of heat or vapor bounding an aerosol are soon surrounded by a region free of particles. Observed in lateral illumination, this particle-free region appears as a dark space sharply separated from the rest of the aerosol. The boundaries of the particle-free space depict a condition of dynamic equilibrium between particle diffusion and the motion caused by temperature gradient in the thermophoretic field or vapor concentration gradient in Stefan flow and diffusiophoresis. Observations on Stefan flow dark space dealing with water-vapor-diffusion fields in plane-to-plane and in spere-to-plane geometries are reported. In the plane-to-plane field, when quantitative measurements were performed on the displacement velocity of the dark space boundary, the actual velocity was found to be lower than the Stefan flow velocity. This difference was interpreted in terms of Brownian diffusion of particles through the boundary. (Author abstract modified)

11717 APTIC NO. 29242

Ellenrieder, G. von, E. Castellano, and H. J. Schumacher

THE KINETICS AND THE MECHANISM OF THE PHOTOCHEMICAL DECOMPOSITION OF OZONE WITH LIGHT OF 2537 A WAVELENGTH. *Chem. Phys. Letters (Amsterdam), 9(2):152-156, April 15, 1971. 17 refs.*

The kinetics of the photochemical decomposition of ozone at 2537 A was investigated in a static system at 5 and 26 C. The 03 pressure was varied between 10 and 100 torr, the oxygen pressure between 0.1 and 300 torr. Inert gases were added up to pressures of 600 torr. Two limiting values for the quantum efficiency were observed, 6.0 and 4.0 molec/hv. The higher value corresponded to oxygen-free systems in the absence of inert gases and the lower value to the same systems in the presence of sufficient high pressure of a foreign gas. Both quantum efficiency values were independent of ozone pressure and temperature. Oxygen had a strong inhibitng effect on the rate of 03 decomposition. The experimental observations are quantitatively explained by a nine-stage reaction mechanism. (Author abstract modified)

11718 APTIC NO. 29248

Tichy, L., J. Hlina, P. Cizek, and V. Havrda

AN ATTEMPT TO EVALUATE THE RESULTS OF SO2 MEASURMENTS BY THE INTEGRATING METHOD IN THE NORTH BOHEMIA REGION. *(Pokus o vyhodnoceni vysledku mereni kyslicniku siriciteho integracni metodou v podkrusnohorske oblast). Text in Czech. Cesk. Hyg. (Prague), 15(6):192-195, 1970. 9 refs.*

During the years 1966 to 1968, the concentration of sulfur dioxide in the atmosphere was measured by an integration method in an industrial area in Northern Bohemia in the districts of Chomutov, Most, Teplice, and Usti. A total of 10 measuring points was established. The results were evaluated by entering the frequency of exceeding the average daily SO2 concentration of 0.15 mg/cu m per meteorological quarter (Dec. to Feb., March to May, etc.) into maps at the scale of 1:200,000. The frequency was expressed in five classes, zero to nine percent of the time, 10 to 24 percent, 25 to 49 percent, 50 to 74 percent, and 75 to 100 percent of the time. The plotted points were connected by isometric lines which indicated the areas of equal pollution. As a result of these studies it became apparent that the greater emission in winter due to increased burning of solid fuels caused a rise in the SO2 content in the atmosphere. Another finding was the substantial influence of meteorological factors. The percentage of values of concentration in excess of the average was significantly greater in 1968 than in 1966, and a trend in that direction reflects the growth of industrial activities in the areas concerned, particularly the steadily rising number of large electric power stations.

11719 APTIC NO. 29252

Larsen, Paul A.

AUTOMATIC STEREOPLOTTING FOR MAPPING AND MEASURING POLLUTED AIR MASSES. *In: Photogrammetric Techniques Applicable to Earth Resources Analyses. George C. Marshall Space Flight Center, Huntsville, Ala., Aero-Astrodynamics Lab. NASA TM X-64546, p. 51-53, Aug. 21, 1970. 1 ref.*

A stereogram prepared from vertical photographs taken from an aircraft at 13,000 ft and showing smoke being discharged from an industrial stack is presented to demonstrate the possibility of mapping industrial pollution using a combination of vertical and oblique photographs. Pairs of vertical photographs similar to thos shown can be used to prepare topographic maps of smoke clouds. The horizontal accuracies of vertical photographs with distance from the source are noted, as are the accuracies of elevation with distance from the source of both vertical and oblique photographs.

11720 APTIC NO. 29266

Parker, Bruce C.

LIFE IN THE SKY. *Nat. Hist. (New York), 79(8):55-59, Oct. 1970.*

The analysis of rainwater with a sampler designed to collect dissolved organic substances has resulted in the speculation that clouds might be viewed biologically, as atmospheric ecosystems having significant numbers of functioning microorganisms. Such microorganisms, representing aeroplankton, do not have to be completely dormant or in resting stages as with spores and pollens, but might under certain circumstances be capable of metabolic activity within clouds, producing among other things, extracellular vitamins. Finally, intracelular vitamins might be released into solution by freezing in clouds. Condensation nuclei, thunderclouds, and the behavior of cumulus clouds are discussed. The distribution and content of moisture in clouds, together with the tendency for moisture to condense around particles, makes it possible that some airborne microorganisms are associated with water droplets in clouds, thereby having sufficient water to perform metabolism. Nutrients are also important if, in addition to cell metabolism, growth is considered. In two series of experiments, dry dust was collected 50 ft or more above ground level and at relative humidities below 100%. When the freshly collected air dust was moistened with TCC solution, numerous cells became visibly pink in fifteen to twenty minutes; a resting or dormant cell normally requires from one to many hours to absorb and convert sufficient TTC to achieve visible concentrations of pink formazan. In a second series of experiments, filters containing dry air dust were placed in transparent plastic chambers. The chambers were sealed, and a measured volume of radioactive carbon dioxide was injected into the chambers. After 24 hours of exposure to the radioactive gas in either darkness or fluorescent lighting, these chambers were opened and the filters removed and treatd with dilute acid and formalin to remove adsorbed or replaced radioactive carbon and to stop all further biological activity. Repeatedly there was higher radioactivity with the non-sterile, air dust filters than with the sterilized controls.

11721 APTIC NO. 29279

Hillmann, Walter

STACK HEIGHT DETERMINATION AND AIR POLLUTION CONTROL. AERODYNAMIC EXPERIMENTS INVOLVING MODELS OF HIGH-RISE BUILDINGS WITH NEIGHBORHOOD STRUCTURES. *(Die Bestimmung von Schornsteinhoehen in Hinblick auf die Luftreinhaltung. Aerodynamische Versuche an Hochbaumodellen unter Beruecksichtigung der Umgebungsbebauung). Text in German. Forschrittber. Ver. Deut. Ingr. Z., 7(14):1-74, March 1969. 21 refs.*

High-rise buildings affect the flow of air in their vicinity and with it the spread of effluents emitted from nearby stacks. Experiments with models of building structures were performed in wind tunnels designed to study how the structures affect air flow velocity and air turbulence. Soap bubbles were blown into the air flow to make smoke plumes visible and to observe and analyze the spread of the effluents. The boundary between disturbed and undisturbed air flow was identified by lines of equal velocity and equal turbulence. The course of these lines behind a high-rise structure is markedly affected by neighboring structures. The experiments disclosed especially advantageous combinations of structures which cause minimum disturbance of air flow. In calculating stack height for heavy smoke emission, the stack discharge must open into an area of undisturbed air flow that is above the boundary line. To meet this requirement, stacks situated in the vicinity of high-rise structures would have to be several times higher. This rule is therefore waived in the case of stacks emitting a moderate volume of effluents.

11722 APTIC NO. 29357

Government Mechanical Lab., Japan, Dept. of Motor Vehicle Safety and Pollution

PHOTOCHEMICAL REACTIONS OF MOTOR VEHICLE EXHAUST GASES. *(Jodosha- haiki-gasu no kokagaku-hanno). Text in Japanese. Kikaishi Nyusu (Govt. Mech. Lab. News), no. 4:1-3, April 1970.*

The problem of air pollution caused by exhaust gases from motor vehicles is becoming serious in urban areas. Photochemical oxidant pollution has already been noted in Tokyo. However, few studies have been made in Japan on photochemical reactions in conditions approaching actual atmospheric conditions. Also, no full-scale devices were available for the study. The Machinery Research Station researched photochemical reactions as part of the research program on motor vehicle exhaust gases. In 1968 a device, called a smog-chamber, was developed. Motor vehicle exhaust gas is diluted several hundred to several thousand times in the atmosphere. Abundant sunlight promotes chain reactions which result in the production of a group of compounds. The smog-chamber duplicates these reactions. An engine is operated in programmed operating modes to make its exhaust gas the same as that formed under actual operating conditions. One fifth of the exhaust gas is diluted several hundred to several thousand times with clean air of constan temperature and humidity. The diluted gas is then transmitted to a ultraviolet irradiation chamber which causes photochemical reactions. The reactions are analyzed by gas analysis. Two experiments were made using the smog-chamber. One examined photochemical reactions between hydrocarbons and nitric oxide. The other tested photochemical reactions of motor vehicle exhaust gases

11723 APTIC NO. 29377

Ukeguchi, Nobuhiro

DIFFUSION OF WASTE FUME. *(Kojo haigasu no kakusan ni tsuite). Text in Japanese. Nippon Kikai Gakkai-shi (J. Japan Soc. Mech. Engr., Tokyo), 74(626):240-246, March 1971. 24 refs.*

The diffusion effect of smoke from a chimney stack (fume) depends on weather conditions such as wind speed and direction. Dilution of smoke occurs with the weather change, and the wind speed determines the rise of smoke. The stability, instability, and equilibrium of air take the form of fanning, looping and coning. The ground surface concentration is usually calculated in the coning case. Inversions cause air pollution in Japan; fine weather with wind speed of less than 3 m/sec in winter causes a very stable air level in the night and the temperature of the air rises with the height. The disturbed inversion level after the sun rises makes the ground air contaminated; the smoke form in this condition is fumigation. Other inversion levels are descent, frontal line and topographical types. Ground smoke concentration is calculated from the average direction and speed of wind and is multiplied by a dilution coefficient to determine long-term average of smoke concentration. Effective rise of fume is the sum of momentum rise, stack height, and rise of fume by the temperature difference between the fume and the air. The calculation of each term is based on Bosangquet s work. Sutton s formula estimates ground smoke concentration. The correction coefficient for the long time average of the ground smoke concentration is based on Smith and Lowry s work. The effect of topographical features, down wash, and down draught are not included in the calculation formulae; the wind tunnel test determines them. The wind tunnel test is widely and practically adopted for the application of smoke diffusion.

11724 APTIC NO. 29383

Yokoyama, Hiroshi and Susumu Kotake

DIFFUSION OF AUTOMOBILE EXHAUST GAS IN A ROAD. PART I. WIND TUNNEL. *(Jidosha haishutsu gasu no doronai kakusan. dai 1 po. Fudo jikken). Text in Japanese. Preprint, Japan Society of Mechanical Engineers, Tokyo, p. 129-132, 1971. (Presented at the Japan Society of Mechanical Engineers, Annual Meeting, 48th, Tokyo, Japan, April 2-6, 1971, Paper 1006.)*

In recent years, it has become obvious that motor vehicle exhaust emissions are creating a social problem. One of the major problems involved in the study of automotive air pollution is the problem of diffusion of exhaust emission along roads, especially roads lined with buildings on both sides. When the diffusion problem is considered from the analytical point of view, it is evident that some factors, such as the state of velocity fiel of air or the diffusion coeffients of matter, have to be determined by means of research experiments, such as wind-tunnel tests. Two wind tunnel tests were made to investigate the state of automobile exhaust gas diffusion by using a two-dimensional model of a road and buildings. One test, using smoke, was made to observe the state of sectional air flow qualitatively. In the other test, the state of diffusion was investigated quantitatively by blowing off a small quantity of heated air uniformly from the road surface of the model. In the form test, the effects of the variation in the main flow velocity of air, in height of buildings, and in width of road was investigated. Some typical examples of the results are presented. In the second test, similar effects were investigated by drawing isothermal line maps. The characteristics clarified in the experiment were that the big vortex of air flow in a road causes a rolling of the isothermal lines, that all the central upper part of road appears concavity of the isothermal lines, and that these characteristics becomes more outstanding with the increase of the main air flow velocity of the wind tunnel.

11725 APTIC NO. 29396

Hunt, G. E.

THE EFFECT OF COARSE ANGULAR DISCRETIZATION ON CALCULATIONS OF THE RADIATION EMERGING FROM A MODEL CLOUDY ATMOSPHERE.

J. Quant. Spectr. Radiative Transfer, 11(3):309-321, March 1971. 13 refs.

Spectral properties of clouds can be studied by mathematical computations of light scattering. Computations were carried out by a computer. Multiple scattering by a plane parallel atmosphere with anisotropic phase functions is a typical problem of terrestrial cloud particles. The albedos and angular distributions of the emergent radiation are computed for a variety of cloud models. The number of angular directions used in the computations are varied to assess their effect upon the computed radiances. The results demonstrate that an extremely fine angular mesh is required to compute accurately the angular distribution of the emergent radiation for possible comparison with observed cloud radiances when errors less than or equal to one percent may be tolerated. The computations of the integrated effects of spherical and local albedos differ by approximately two percent in overall cloud thickness when computed with eight and 32 angular directions. Thus, the integrated effects are required for the possible reduction in computational expenditure. (Author abstract modified)

11726 APTIC NO. 29435

Kiyoura, Raisaku, Yoshisuke Uenishi, Milton Munidasa, Masaya Iguchi and Toru Kuramoto

FORMATION OF SULFURIC ACID MIST IN ATMOSPHERE AND EFFECT OF HUMIDITY, ETC.

(Taikichu ni okeru ryusan misuto no seisei to shitsudo nado no eikyo). Text in Japanese. Preprint, Japan Chemical Society, Tokyo, 1p., 1971. (Presented at the Japan Chemical Society, Annual Meeting, 24th, Tokyo, March 1971, Paper 3405.)

Although qualitative discussion on sulfuric acid mist did take place in industrial areas or in big cities, very little research ha been done after trapping it directly. However, as the study on animal experiments by Amdur, et al. indicates, the effects of sulfuric acid mist on respiratory organs is much worse than that of sulfuric acid gas. The concentration of sulfuric acid mist was trapped by groups of different diameters, using a cascade centripeter, taking note of the diameter in the range of 0.4-3.5 micron, and the concentration of sulfuric acid mist in the atmosphere was measured by titration. Eighty percent of sulfuric acid mist in Tokyo was of 0.4-1.2 micron and 100% in Amagasaki City was of that range. Sulfuric acid mist was formed when the followin conditions existed: high humidity (especially 60-70%), no wind, or slight breeze, and high concentration of floating dust. In winter, when the atmosphere is dry, there is hardly any sulfuric acid mist, and it is often found when the floating dust in the atmosphere is basic. This is thought to be due to the fact that in low humidity, even when sulfuric acid gas concentration is high, its oxidation reaction is suppressed. It is not correct to regard the smog which occurred around Suginami Ward in Tokyo, from the middle to the end of July, 1970, as the same photochemical smog as the Los Angeles type. It was confirmed that it was multiple pollution, connected with sulfuric acid mist at least.

11727 APTIC NO. 29445

Roberts, Walter Orr

INADVERTENT WEATHER MODIFICATION.

In: A Century of Weather Progress. American Meteorological Society, 1970, p. 165-170. 25 refs.

Natural climate changes have occurred on all geographic scales and at all time intervals. But man may cause the greatest intervention and inadvertent weather modification might become a hugh problem. The development of megalopolises will alter the Earth s albedo, the surface roughness, add heat to the atmosphere, and add dust and other particulates. Although there is little data on such effects, the data which has been obtained is quite striking. For example, an increase of 57% turbidity was found over Washington, D. C. between 1905 and 1964, and an 88% increase was found in Davos, Switzerland between 1920 and 1958. Urban effects include an increase in heat near cities, changes in inversion stability, and fog formation over a wide region. Energy production leads to heat dumping which by 2000 A.D. will reach 0.2% of the solar radiation absorbed by the Earth. Carbon dioxide has also increased by 0.2% per year; it may increase world temperatures through an increased greenhouse effect which results from its infrared opacity Mathematical models are being developed to study this effect. Particulate contamination may decrease precipitation. The city of La Porte, Indiana was found to be effected by upwind industrial pollution. A rainfall increase of 30% has occurred along with a 200% increase in hailstorms. And other studies show a relationship between freezing nuclei and weather changes. Lead compounds produced by the combustion of leaded gasoline, smoke from wood burning, and other pollutants can cause ice nuclei. Also, subsonic jet aircraft can cause suddenly-forming cirrus clouds. A Global Atmospheric Research Program has been established to assess the prospects for large-scale weather modification.

11728 APTIC NO. 29447

Zdunkowski, Wilford G. and Roger L. Weichel

RADIATIVE ENERGY TRANSFER IN HAZE ATMOSPHERES.

(Strahlungsuebertragung in dunsthaltigen Atmosphaeren). Beitr. Physik Atmosphaere, 44(1):53-68, 1971. 34 refs.

Deirmendjian s haze models C and M, representing continental and coastal regions, are used to obtain haze particle attenuation parameters and phase functions for the entire heat spectrum. These data are used in part to compute the distribution of infrared radiative energy in mixed atmospheres which contain haze and water vapor. The following atmospheric conditions are investigated: a normal haze distribution; a very dense haze layer trapped by a ground inversion; and a dense haze layer located below the tropopause. Radiative intensities are not only computed for the boundaries of haze layers for various zenith angles but also for various heights. The intensities are displayed for the entire water vapor window, extending from 8.25 to 13.0 micron, in all three cases. In addition, radiative fluxes pertaining to the total infrared spectrum ranging from 3.75 to 92.5 micron are discussed in conjunction with the dense haze layer near the ground. Also, resulting radiative temperature changes are obtained and displayed graphically. A normal haze distribution in the atmosphere does not influence the infrared radiation field significantly. Dense haze layers, however, cannot be neglected in atmospheric radiation calculations, since they substantially influence the heat budget at the surface of the earth and the outgoing radiation at the top of the atmosphere. All computations are based on the exact transfer theory as described by Chandrasekhar (1960). The exact shape of spectral lines is accounted for. (Author abstract)

BASIC SCIENCE AND TECHNOLOGY

11729 APTIC NO. 27264

Borisova, L. V. and T. I. Yarinova

INTERACTION BETWEEN RHENIUM HEPTOXIDE, SULPHURIC ACID, AND SULPHUR DIOXIDE. *Russ. J. Inorg. Chem. (English translation from Russian of: Zh. Neorgan. Khim.), 15(2):164-166, 1970. 9 refs.*

Under industrial conditions, in the heat treatment of molybdenite and cupromolybdenum sulfide ores, the sulfur dioxide carrying gases entrain other volatile components: these are gaseous oxides and sulfides of various elements, in particular rhenium. When rhenium heptoxide is absorbed in concentrated sulfuric acid (14.5-18.5 M) and also in acid saturated with sulfur dioxide, pink solutions are formed due to a partial reduction of rhenium VII to rhenium VI. The complete light absorption spectrum of the pink solution is presented, as it shows characteristic intense bands in the visible region at 520 nm and in the ultraviolet region at 320 nm. The optimum conditions for the reduction of Re207 to the hexavalent state with sulfur dioxide were found as a function of sulfuric acid concentration (18.5 M) and reaction temperature (120 C). (Author abstract modified)

11730 APTIC NO. 27269

Dorfman, Ya A., G. D. Zakumbaeva, and D. V. Sokol'skii

A POTENTIOMETRIC STUDY OF THE BEHAVIOR OF ACETYLENE HYDROGENATION AND CARBON MONOXIDE OXIDATION CATALYSTS IN AN ELECTROCHEMICAL SYSTEM. *Russ. J. Phys. Chem. (English translation from Russian of: Zh. Fiz. Khim.), 44(5):667-670, 1970. 13 refs.*

The possibility of the electrochemical stabilization of the catalytic system PdX4(2-)-CuX2(-)-CuX3(-)-FeX4(-)-FeX4(2-)-H20 for the oxidation of carbon monoxide with molecular oxygen and the system Hg-HgSO4-Hg2SO4-H2SO4-H20 for the hydration of acetylene was demonstrated. Characteristic kinetic and potential curves are presented for the oxidation of CO and the hydration of acetylene in the presence and absence of electric current. In addition, a mechanism is proposed for the stabilization of the catalytic systems investigated. (Author abstract modified)

11731 APTIC NO. 27274

Rosenberg, C. W., von, Jr. and K. L. Wray

VIBRATIONAL RELATION OF CO BY FE ATOMS. *J. Chem. Phys., 54(3): 1406-1407, 1971. 7 refs.*

The vibrational relaxation of carbon monoxide by a metal vapor was observed in a shock tube study on highly dilute mixtures of iron carbonyl in argon. Behind incident shocks the Fe(CO)3 decomposes very quickly, yielding vibrationally cold CO which is then very efficiently relaxed by the Fe atoms with a probability per collison of about 1/100.

11732 APTIC NO. 27280

Gidwani, Ram

A REVIEW OF FUNDAMENTALS OF PARTICLE SIZE DISTRIBUTION OF POWDER AEROSOLS. *Aerosol Age, 16(2):22-24, Feb. 1971. 6 refs. (Presented at the Chemical Specialties Manufacturers Association, 57th Annual Meeting, New York, Dec. 1970.)*

Operability of powder aerosols is a function of the particle size of the solid particles suspended in the propellant phase. Particle size distribution plays a key role in the long term storage stability of suspensions, while it is also considered a critical factor in the evaluation of the inhalation toxicity of powder-based cosmetic aerosols. Clinical evaluation of pharmaceutical aerosols had indicated that the particle size distribution of suspended therapeutic agents is directly related to the efficacy of these products. Some mathematical concepts are presented for understanding the principles underlying particle size distribution. Analyses by using a sieve technique and the cascade impactor are discussed.

11733 APTIC NO. 27374

Gieseke, James A.

THERMAL FORCES ON AEROSOL PARTICLES. *Battelle Memorial Inst., Columbus, Ohio, Columbus, Labs., NAPCA Grant AP 00503-02, 29p., May 28, 1970. 31 refs.*

Experiments were conducted to determine the validity of previous measurements of the thermal force exerted on aerosol particles, (that force resulting from energy 'transferred to the particle by mean thermal motion of the surrounding gas molecules') and to study the effects of geometry on the measured force. In addition, experiments were initiated to determine the effects of surface properties on the thermal force. The experimental apparatus consisted primarily of a Millikan-cell with temperature control on both the upper and lower plates; the basic procedure for the computer-programmed analysis was to use gas temperature and pressur along with falling velocity to obtain an estimate of particle size, adjusted for momentum slip. It was concluded that (1) the measured thermal force for tricresyl phosphate particles in air is unaffecte by thermal-cell geometry over the range of 4.9 to 14.9 for the rati of plate diameter to plate spacing, and (2) accommodation coefficients can have a pronounced effect on the thermal force, with the force decreasing with the accommodation coefficients. Previous thermal force experiments, and the theory for small particles, large particles, and the transition region are reviewed. (Author conclusions modified)

11734 APTIC NO. 27459

Hancock, G. and I. W. M. Smith

VIBRATIONAL RELAXATION RATES FOR CO (V LESS THAN OR EQUAL TO 13) WITH CO (V EQUAL TO O), OCS, O2 AND HE. *Chem. Phys. Letters (Amsterdam), 8(1):41-44, Jan. 1, 1971. 18 refs.*

Rate constants for collisional de-excitation of individual vibrational levels of carbon monoxide (4 less than or equal to v less than or equal to 13) were determined by observing the quenching of the infrared emission bands by added gases. Relaxation by He must occur by vibration-translation (V-T) energy transfer. However, the rates of de-excitation by OCS, CO, and O2 are consistent with vibration-vibration (V-V) energy transfer. This conclusion is supported by the observation that energy transfer becomes less probable as the exchange of a single vibrational quantum becomes less resonant. The exchange of energy between CO and OCS, which occurs with high probabilities, would excite the strongly infrared active v3 mode of OCS and may arise through long-range dipole-dipole coupling. The implications of these findings for CO lasers are briefly discussed.

11735 APTIC NO. 27461

Schaefer, Henry F., III. and Stephen Rothenberg

MAGNETIC HYPERFINE STRUCTURE OF NO2. *J. Chem. Phys., 54(3): 1423-1424, 1971. 19 refs.*

Self-consistent-field (SCF) calculations are presented for the magnetic hyperfine structure parameters of nitrogen dioxide. With respect to properties at the nitrogen nucleus, the theoretical values are in excellent agreement with recent accurate experimental values. Calculated properties at the oxygen nucleus are in qualitative agreement with experimental values but all are of insufficient magnitude. Differences in values for the oxygen nucleus parameters are attributed to the Hartree-Fock approximation in which all spin-dependent properties depend only on the singly occupied 6a1 molecular orbital. An analysis of the 6a1 orbital indicates a configuration that would allow other orbitals to appear in an unimpaired manner with a consequent increase in the values of the magnetic hyperfine structure parameters with respect to the oxygen nucleus.

11736 APTIC NO. 27465

Urano, Kohei and Raisaku Kiyoura

TREATMENT OF JAPANESE COAL WITH SULFURIC ACID FOR THE PREPARATION OF CATION-EXCHANGER. *(Yoion kokanzai seizo notameno sekitanrui no ryusanshori). Text in Japanese. Kogyo Kagaku Zasshi (J. Chem. Soc. Japan), 74(2):247-252, Feb. 1971. 24 refs.*

Nineteen kinds of coal and 2 kinds of low-temperature dry distillate coal were treated with sulfuric acid and studied for their ion exchange capacity, composition, pore distribution, etc. Also, to clarify the reaction of coal with sulfuric acid, the gas generated was analyzed. A treatment time of 2-3 hours was found to be sufficient. The optimum temperature for the reaction was 80 C. The conventional treatment involving long periods at high temperature was proved unnecessary. Anthracite and dry distilled coal were not reactive with sulfuric acid. All Japanese coals with 66-89% carbon are a good cation exchangers with more or less uniform total cation exchange capacity, pore distribution, and true specific gravity. The cation exchange capacity for strong or weak acid was between 0.5 and 1.2 milli equivalent/gram, the sum of the two being 1.7 plus or minus 0.3 milli equivalent/gram. The reaction of coal with sulfuric acid was sulfonation accompanied by oxidation and decomposition, generating SO2, CO2, or CO. When highly carbonized coal was treated at high temperature, strong oxidation and decomposition reactions took place, resulting in a large amounts of SO2. A great change in pore distribution and true specific gravity of coal resulted. More detailed studies of this reaction can be expected, either for application purposes or for the basic study of the chemical structure of coal.

11737 APTIC NO. 27469

Swamy, K. N. and R. V. Gopla Rao

THE THERMODYNAMICS OF LIQUID HYDROGEN SULPHIDE AND CARBON MONOXIDE AND SIGNIFICANT STRUCTURE THEORY. *Z. Physik. Chem. Neue Folge (Frankfort), 71(4-6):218-229, 1970. 16 refs.*

The partition functions of both liquid hydrogen sulfide and carbon monoxide and formulated from Significant Structure theory. Based on heat capacity and viscosity data, rotation is assumed in both liquid and solid phases in each case. Thus the hydrogen sulfide molecule is assigned a three degree Einstein oscillator with three internal modes of vibration and three degrees of rotation in the solid-like part. The carbon monoxide molecule is considered as a three degree Einstein oscillator with one internal mode of vibration and two degrees of rotation. In both cases, the calculated and observed equilibrium properties are in satisfactory agreement. (Author abstract modified)

11738 APTIC NO. 27530

Chao, Chien-Chung and Jack H. Lunsford

INFRARED STUDIES OF THE DISPROPORTIONATION REACTION OF NITRIC OXIDE ON Y-TYPE ZEOLITES. *J. Am. Chem. Soc., 93(1):71-77, Jan. 13, 1971. 17 refs.*

Infrared spectra produced by the adsorption of nitric oxide on four different Y-type zeolites (CaY, NaY, HY, and decationated Y) were examined. Except for HY, which is rather inactive, at least eight absorption peaks were observed on each zeolite. The peaks were identified by examining the equilibrium which exists between the adsorbed molecules and gas-phase nitrogen oxides, and comparing the spectra of the adsorbed species with the infrared spectra produced by adsorption of various nitrogen oxides on zeolites. The spectra are assigned to adsorbed N2O, NO2(+), N2O3, NO3(-), a nitrito complex, and covalently bonded nitrite. The reaction produced N2O and NO2 as final gas-phase products. CaY exhibited the greatest catalytic activity and HY the least. Y and NaY are approximately equal in activity. CaY can catalyze the reaction at room temperature, while NaY and Y require -78 deg. For HY, very little reaction occurs even at -78 deg. Based on the experimental evidence, a four-step disproportionation mechanism is proposed. (Author abstract modified)

11739 APTIC NO. 27567

Men'shov, V. N., S. M. Loktev, I. P. Mukhlenov, Yu. B. Kagan, and V. M. Pomerantsev

SYNTHESIS OF ALCOHOLS FROM CO AND H2 IN A FLUIDIZED BED OF IRON CATALYST. *J. Appl. Chem. USSR (English translation from Russian of Zh. Prikl. Khim.), 43(8):1904-1906, Aug. 1970. 6 refs.*

Optimal conditions were determined for the synthesis of higher alcohols from carbon monoxide and hydrogen in a fluidized bed of fine iron catalyst. There are as follows: pressure, 50 atm; temperature, 170-190 deg; linear velocity, 4 cm/sec; space velocity, 15,000 reciprocal h. Under these conditions a fluidized bed is as selective as a fixed bed.

11740 APTIC NO. 27609

Cheng, Robert T., John O. Frohliger, and Morton Corn

AEROSOL STABILIZATION FOR LABORATORY STUDIES OF AEROSOL-GAS INTERACTIONS. *Preprint, Air Pollution Control Assoc., Pittsburgh, Pa., 26p., 1970. 12 refs. (Presented at the Air Pollution Control Associa-*

tion, Annual Meeting, 63rd, St. Louis, Mo., June 14-18, 1970, Paper 70-114.)

In the technique described, aerosol particles are deposited on an inert substrate such as teflon beads. The deposition is carried out in a fluidized bed to insure discrete aerosol deposition and to achieve a uniform distribution of aerosol concentration on the supporting beads. Aerosol-gas interactions can be conveniently investigated by exposing these stabilized aerosols to the reacting gases in dynamic or static systems without altering the nature of the aerosol. Laboratory results obtained by using stabilized aerosols may be extrapolated to the atmospheric environment. This technique was applied to an investigation of the particulate catalyzed atmospheric oxidation of sulfur dioxide. Teflon beads with deposited aerosol particles were exposed to 4 to 42 ppm of SO2 in a plug flow reactor. The rate of SO2 oxidation influenced by type of catalyst, concentration of catalyst, relative humidity, and concentration of the SO2. The rate of oxidation by sodium chloride particulate was measurable at low to moderate relative humidities (45% to 69%), but the rate was a few orders of magnitudd higher when the NaCl catalyst particles change from solid form into droplet form at high relative humidities (more than 80%). If results of these studies are applied to the atmosphere, assuming an SO2 concentration of 1 ppm, catalyst concentration equivalent to 50 micrograms/cu m of CuCl2 and 60% relative humidity at 25 C, the atmospheric oxidation rate of SO2 amounts to 1% per 120 min. (Author abstract modified)

11741 APTIC NO. 27613

Solly, Richard K., David M. Golden, and Sidney W. Benson

KINETICS AND THERMOCHEMISTRY OF THE GAS PHASE REACTION OF METHYL ETHYL KETONE WITH IODINE. II. THE HEAT OF FORMATION AND UNIMOLECULAR DECOMPOSITION OF 2-IODO-3-BUTANONE. *Inter. J. Chem. Kinet., vol. 2:393-407, Sept. 1970. 23 refs.*

Equilibrium constants for the reaction of methyl ethyl ketone with iodine and its reverse iodoacetone with hydrogen iodine have been computed to fit the kinetics of the reaction of iodine atoms with methyl ethyl ketone. From a calculated value of the entropy of methyl ethyl ketone equal to 93.9 + or 1.0 gibbs/mole and the experimental equilibrium constants, the enthalpy of methyl ethyl ketone is -38.2 + or - 0.6 kcal/mole. The change in enthalpy value on substitution of ahydrogen atom by an iodine atom in the title compound is compared with that for isopropyl iodide. The relative instability of 2-iodo-3-butanone (3.4 kcal/mole) is presented as further evidence for intramolecular coulombic interaction between partial charges in polar molecules. The unimolecular decomposition of 2-iodo-3-butanone to methyl vinyl ketone and hydrogen iodide was also measured in the same system. This reaction is relatively slow compared to the formation of the above equilibrium. Rate constants for the reaction over the temperature range 281 C to 355 C are given. The stability of both the ground and transition states is discussed in comparing this activation energy with that reported for the unimolecular elimination of hydrogen iodide from other secondary iodides. The kinetics of the reaction of hydrogen iodide with methyl vinyl ketone were also measured. The addition of HI to the double bond is not rate controlling, but the rate of formation of 1-iodo-3-butanone is more rapid than that for 2-iodo-3-butanone. Both four-and six-center transition complexes and iodine atom- catalyzed addition are discussed in analyzing the relative rates. (Author abstract modified)

11742 APTIC NO. 27622

Wilson, William E., Jr., Arthur Levy, and D. B. Wimmer

A STUDY OF SULFUR DIOXIDE IN PHOTOCHEMICAL SMOG. II. EFFECT OF SULFUR DIOXIDE ON OXIDANT FORMATION IN PHOTOCHEMICAL SMOG. *Preprint, Air Pollution Control Assoc., Pittsburgh, Pa., 54p., 1970. 39 refs. (Presented at the Air Pollution Control Association, Annual Meeting, 63rd, St. Louis, Mo., June 14-18, 1970, Paper 70-115.)*

The interactions of sulfur dioxide with photochemical smog were investigated in environmental chambers, using a Mast meter for oxidant measurements and coulometric instrument for monitoring SO2. A regression analysis, carried out on the data from 23 chamber experiments with 1-butene, indicated that the effects of SO2 on oxidant production depend on the concentrations of water vapor, initial nitrogen dioxide, and sulfur dioxide. The effect also depends on the type of hydrocarbon. SO2 was found to reduce the maximum oxidant obtained from 1-butene, 1-heptene, and 2,2,4- trimethylpentane, but to increase the oxidant obtained from toluene. In all cases, however, the maximum NO2 concentration was lower when SO2 was present. The reaction mechanisms involved in producing these effects are discussed. The results confirm the interaction of SO2 with photochemical smog suggested in previous reports and explain its absence in other studies. Because the interaction is complex it is possible that under certain experimental conditions the SO2 effect might be small, and if the operative factors were not carefully controlled it would not be evident. However, it can be significant and should be considered in predicting the effects of various control measures on air quality. (Author abstract modified)

11743 APTIC NO. 27623

Suzuki, Shin, Kazuyuki Sugita, and Masao Suzuki

DIFFUSION OF SULFUR DIOXIDE AND NITROGEN DIOXIDE INTO A MIST. *Preprint, Air Pollution Control Assoc., Pittsburgh, Pa., 24p., 1970. 5 refs. (Presented at the Air Pollution Control Association Annual Meeting, 63rd, St. Louis, Mo., June 14-18, 1970, Paper 70-116.)*

Studies were made of the hypothesis that gaseous pollutants such as sulfur dioxide and nitrogen dioxide are absorbed into a mist suspended in a contaminated atmosphere. A differential equation explaining this phenomenon in two-dimensional terms was derived by considering the double boundary layer theory at a gas-liquid interface. Experimentally, the sample gas was introduced into a reactor and contacted with a two-dimensional droplet (model mist), previously treated with an acid indicator, that was sandwiched between two glass plates. A colored ring which appeared simultaneously with the gas-droplet contact at the circumference of the droplet gradually shrank as the absorbed gas diffused toward the center of the droplet. The rate of diffusion was observed by a specially designed optical system. The data obtained were used to solve the derived equation and thus the overall coefficient of the boundary layer, regarded as a measure of the ease of gas absorption into a mist, was calculated. Statistical analysis of the results showed that the diffusion rate of the gases into the droplet depends on the flow rate of gas streaming outside the droplet, the diffusion becoming easier as the flow rate increases. The absorption rate of NO2 is larger than that of SO2. Although the dependence of the diffusion rate on the size of the droplet was studied, no definite conclusions were reached.

11744 APTIC NO. 27640

Winchester, John W.

CHEMICAL EQUILIBRIA OF IODINE IN GREAT LAKES WATERS. *Preprint, Michigan Univ., Ann Arbor, Great Lakes Research Div., 9p., 1970. 15 refs. (Presented at the Conference on Great Lakes Research, 13th, Buffalo, N. Y., March 31,- April 3, 1970.)*

Iodine in Great Lakes water, 1-3 microgram/l, is uniformly distributed and near the content of natural rainfall without evidence of strong additional pollution sources. These concentrations, 20-60 times lower than in sea water, may present an environmental stress to organisms where iodine is an essential element. In the sea, iodine is utilized mainly as iodide by vertebrates and by brown and red algae. Although thermodynamically iodate is the most stable form in aerated water, about half the total iodine is believed to exist as iodide, and a biochemical recycling of iodide in the marine biosphere is suggested. In fresh water, blue-green and green algae are not known to require iodine and may not therefore aid in keeping iodine in the reduced form. Therefore, iodide available to vertebrates in lake water, and especially to anadromous fish which have become adapted to live in lake water, may be in much shorter supply than suggested by the low concentration of total iodine alone. (Author abstract)

11745 APTIC NO. 27655

Meyer, Vincent D. and Edwin N. Lassettre

EXPERIMENTAL DETERMINATION OF OSCILLATOR STRENGTHS FOR THE CO A 1-PI PRODUCED FROM CHI(1)EPSILON(+) BANDS. *J. Chem. Phys., 54(4): 1608-1610, Feb. 15, 1971. 8 refs.*

The oscillator strengths for three bands in the transition A 1-pi produced from chi(1)epsilon(+) bands of carbon monoxide were determined from electron impact spectra of mixtures of carbon monoxide and helium using the known oscillator strength for the 1(1)S yielding 2(1)P transition in helium as a reference. The oscillator strength for band equal to 2 excited state is 0.045 plus or minus 0.005. (Author abstract)

11746 APTIC NO. 27657

Haase, Werner

THERMODYNAMIC STUDIES ON EXHAUST GAS TURBO-CHARGING AND TURBO- COOLING. *(Thermodynamische Studie zur Abgasturbosufladung und Turbokuehlung). Text in German. MTZ-Motortechnische Zeitschrift, 32(1):6-14, 1971. 57 refs.*

In the simplest form of turbo-charging the combustion engine is equipped with a turbosupercharger and is gas dynamically coupled with both the turbine and the supercharger. The exhaust gas energy from the gas turbine supercharges the combustion air ingested by the supercharger. The supercharger for 100 to 500 PS motors consists generally of a radial condenser and a radial turbine. Motors more powerful than 500 PS use axial turbines. Turbo-cooling interposes a second turbocharger into the air stream to achieve intensive air cooling. The turbocooler reduces the thermal stress on the motor and thus enhances the output especially of gas turbines. The theoretical laws governing turbocharging and turbocooling are derived from energy and material balances of turbosuperchargers and of turbocooling aggregates. While turbocooling has hitherto been considered only in connection with the improvement of the output of combustion engines it may be in future also applied advantageously in cooling and in air conditioning equipment.

11747 APTIC NO. 27663

Bareiko, V. V.

INFLUENCE OF OXYGEN ON THE CATALYTIC ACTIVITY OF PLATINUM IN THE OXIDATION OF SULFUR DIOXIDE. *Kinetics Catalysis (English translation from Russian of: Kinetika i Kataliz), 11(4):784-788, July-Aug. 1970. 12 refs.*

A quantitative study was made of the influence of high-temperature treatment of platinum in oxygen on its catalytic properties in the oxidation of sulfur dioxide. The catalytic activity of platinum was found to be a function of the temperature and the time of treatment, with platinum saturated with oxygen at temperatures above 475 C showing a sharp decrease in catalytic activity. The reduced activity is associated with the diffusion of oxygen in the platinum filament. The 'passivating' oxygen can be liberated from the platinum by exposure of the filament to a stream of sulfur dioxide and inert gas.

11748 APTIC NO. 27667

Boreskov, G. K., V. A. Dzis'ko, D. V. Tarasova, and G. P. Balaganskaya

EFFECT OF THE ACTIVE COMPONENT FILM'S THICKNESS ON THE ACTIVITY OF VANADIUM CATALYSTS FOR THE OXIDATION OF SULFUR DIOXIDE. *Kinetics Catalysis (English translation from Russian of: Kinetika i Kataliz), 11(1):144-148, Jan.-Feb. 1970. 8 refs.*

The activity of vanadium pentoxide catalysts in the oxidation of sulfur dioxide was studied with respect to the effects of catalyst surface area, vanadium pentoxide concentration, and K20/V205 ratio. At 420 and 485 C an increase in catalyst surface increased oxidation activity. At 485 C catalytic activity reached a maximum at a vanadium pentoxide concentration of 10%; at 420 C maximum activity was noted at a vanadium pentoxide concentration of 6.5 8%. Catalyst activity at 420 C, but not at 485 C, dependeded on the K20/V205 ratio. An increase in catalytic activity at 420 C with an increase in the K20/V205 ratio is apparently associated with the fact that potassium pyrosulfate prevents the crystallization of the solid phases which are formed from the melt at low temperatures.

11749 APTIC NO. 27764

Seliverstov, V. M.

SELECTION OF ABSORBENTS FOR FLUORINATED HYDROCARBONS. *J. Appl. Chem. USSR (English translation from Russian of: Zh. Prkl. Khim.), 43(3):694-696, March 1970. 13 refs.*

The solubilities of Freons in various organic solvents were estimated on the basis of solution deviation from Raoult's law, as determined from known values of the dielectric constants of solutio components. The satisfactory agreement between predicted and actual solubilities indicates that searches for new Freon refrigeration systems should be confined to organic compounds of groups III and IV (in Ewells' classification) and that best solubility results are to be expected when the two components forming the solution have similar dielectric constants. Group III comprises those substances whose molecules contain electrondonor atoms and group IV substances whose molecules contain active hydrogen atoms.

11750 APTIC NO. 27766

Rosser, W. A., Jr., R. D. Sharma, and E. T. Gerry

DEACTIVATION OF VIBRATIONALLY EXCITED CARBON DIOXIDE (001) BY COLLISIONS WITH CARBON MONOXIDE. *J. Chem. Phys., 54(3):1196-1205, Feb. 1, 1971. 21 refs.*

A pulse of 10.6 micron radiation from a Q-switched carbon dioxide laser may be used to produce in a test gas containing CO2 a non-equilibrium population of CO2 (001); the return to equilibrium may be studied by monitoring the fluorescence radiation in the vicinity of 4.3 micron. The method is adaptable to study in a temperature range (300 to 1000 K) not easily attainable by conventional electric heating. The processes involved, the associated rate constants, and determination of the decay constant are discussed. Relaxation of excess vibrational energy in a mixture of CO2 and carbon monoxide involves both vibration-vibration coupling and temperature-vibration degradation. The rate constants associated with the deactivation of vibrationall excited CO2 (001) by collisions with CO have been experimentally determined from 300 to 900 K by this laser fluorescence method. The probability per collision of vibrational energy transfer from CO2 (001) to CO was computed by a theory involving long range forces. The calculated probabilities, using only multipolar interaction and only exponential repulsive interaction, are in equally good agreement with the probabilities deduced from measurement of the transfer rate constant in the exothermic direction. (Author abstract modified)

11751 APTIC NO. 27778

Gargioli, Fulvio and Francesco Panke

STUDY OF TECHNICAL CHARACTERISTICS OF FLUTTER VALVES IN CONTINUOUS AND DISCONTINUOUS AIR FLOW. *(Untersuchungen der technischen Eigenschaften der Ausatemventile im kontinuierlichen und diskontinuierlichen Luftstrom). Text in German. Staub-Reinhalt. Luft, 30(12):514-518, Dec. 1970.*

The technical characteristics of flutter valves in gas masks and their performance were subjected to a mathematical analysis in order to discover the cause of the irregular functioning of some valves. Because of the complex nature of the real system the calculations were based on a theoretical model whose dead space communicated with the atmosphere by the opening of a valve. In spite of the simplicity of the model and of the approximations used the valve pressure drop values were in good agreement with experimental data obtained with six different types of valves in masks operated by an artificial lung in a continuous and a discontinuous air flow of 30 and 50 l air/min. The pressure drop curve obtained from a faulty valve disclosed that the malfunction was due to the circumstance that the two membranes of the flutter valve opened at different times.

11752 APTIC NO. 28367

Nenquin, G., G. Fally, and J. van Remortel

STUDY OF GASES FORMED BY THE COMBUSTION OF MIXTURES: AMMONIUM NITRATE WITH AMMONIUM CHLORIDE AND AMMONIUM CHLORIDE WITH AN ALKALI OR ALKALINE EARTH NITRATE; REDUCTION AND NITROUS VAPORS IN GUNSMOKE. *(Etude des gaz de combustion des melanges: 'nitrate ammonique - chlorure ammonique' et 'chlorure ammonique - nitrate alcalin ou alcalino-terreux'; reduction des vapeurs nitreuses dans les fumees de tirs). Text in French. Ann. Mines Belg., 11:1287-1307, Nov. 1970. 9 refs.*

The combustion of ammonium nitrate-sodium chloride-ammonium chloride mixtures was studied in a closed environment, using the application of heat to ignite the mixture. The yield was determined from the variation in pressure within the reaction chamber, which was simultaneously measured by inductive and piezoelectric collectors. Analyses of nitrogen oxides and hydrochloric acid were made for gases resulting from the combustion of NH4NO3-NaCl mixtures, as well as for NH4NO3-NaCl-NH4Cl and KNO3-NH4Cl mixtures. Nitrogen oxides such as nitrogen dioxide and nitrous oxide were detected by infra-red absorption spectrometry. Hydrochloric acid was determined indirectly by atomic absorption, using flame spectrometry. Combustion gases obtained from mixtures rich in ammonia contained less NO2, which is an extremely poisonous gas. The possibility was also discovered of limiting the total hydrochloric acid formed during combustion, by using certain manganese salts, which at the same time have no detrimental effect on the yield obtained.

11753 APTIC NO. 28423

Khesina, A. Ya., N. P. Shcherbak, L. M. Shabad, and I. S. Vostrov

BENZYPYRENE BREAKDOWN BY THE SOIL MICROFLORA. *Bull. Exp. Biol. Med. (USSR) (English translation from Russian of: Byul, Eksperim. Biol. i Med.), 68(10):1139-1141, Oct. 1969. 8 refs.*

Measurements of the benzpyrene content of selected soils were made before and after exposures of one, two, and three months. The results show that soil microflora are able to destroy up to 70% of the benzpyrene contained in soil, provided the soil is moist. This phenomenon is evidently due to the metabolic activity of the microorganisms and is most marked in soil contaminated with polycyclic hydrocarbons from industrial waste.

11754 APTIC NO. 28581

Mellor, R., N. A. Chigier, and J. M. Beer

PRESSURE JET SPRAY IN AIR STREAM. *Preprint, American Society of Mechanical Engineers, New York, 8p., 1970. 16 refs. (Presented at the American Society of Mechanical Engineers Gas Turbine Conference and Products Show, Brussels, Belgium, May 24-28, 1970, Paper 70-GT-101.)*

A study was made of droplet trajectories in a hollow cone pressure-jet water spray operating in a uniform axial airflow of 13.9 m/s. Use of a double spark light source enabled measurements of drop velocities, sizes, and angles of trajectories to be made on droplets from 20 to 250 micron and with velocities up to 37 m/s. Entrainment in the spray of the surrounding airflow was negligible in a wind tunnel, and it was possible to predict the trajectories of individual drops on the basis of the steady-state equation of motion for single solid spheres in an infinite quiescent atmosphere. Average droplet behavior could not be predicted because of the wide variation in initial droplet conditions.

11755 APTIC NO. 28638

Ciborowski, Janusz and Zbigniew Z. Hulewicz

THE INFLUENCE OF PACKING POROSITY ON AEROSOL PARTICLE DEPOSITION IN A SCRUBBER. *Intern. J. Heat Mass Transfer., 14(2):185-198, Feb. 1971. 66 refs.*

A glass-packed scrubber 70 cm high and 5 cm in diameter was used to investigate the influence of aerosol superficial velocity and bed porosity on the process of wet aerosol deposition. The fundamental measured quantity was the drop of the initial mass concentration of aerosol stream caused by passing the stream through the wetted, porous packing of the scrubber. Inertial, diffusion, and interception mass-transfer coefficients were obtained. The overall mass-transfer coefficients were found to increase with increase of Reynolds number and decrease of bed porosity. The increase of coefficients with decreased porosity is explained by an increase of effective interfacial surface. Formulae are presented for correlating the mass transfer coefficients with mass-stream aerosol concentrations in the scrubber.

11756 APTIC NO. 28689

Anderson, A. and T. S. Sun

RAMAN SPECTRA OF MOLECULAR CRYSTALS. CARBON DIOXIDE AND NITROUS OXIDE. *Chem. Phys. Letters (Amsterdam), 8(6):537-542. March 15, 1971. 26 refs.*

Polycrystalline samples of carbon dioxide and nitrous oxide, excite by the 5145 A line of an argon laser, exhibited Raman spectra at 18 and 79 K. Lattice and molecular modes are assigned according to predictions from the known crystal structures, and the observed lattice frequencies are compared with calculated values. (Author abstract modified)

11757 APTIC NO. 28804

Kelly, C. I.

LIQUEFIED NATURAL GAS, PART II. THE PRACTICAL DEVELOPMENT OF LIQUEFACTION, STORAGE AND REGASIFICATION OF THE LIQUID. *Petrol. Times, vol. 62:120-124, 132, Feb. 1958.*

The liquid propane gas industry, including the storage and regasification of natural gas, first took commercial form in the middle 1930's as a result of the need of the utility companies to draw reserve supplies to meet peak cold-spell loads. Long-distance pipe lines large enough to supply maximum winter demand were too expensive. An intensive study of natural gas storage problems was begun in 1937. In 1939, a pilot plant was erected in West Virginia; and in 1941 a full-scale plant was completed near Cleveland. Operation during the cold spell of February, 1941, proved the beneficial results of the plant for the utility company and for industry, which would have had its gas supply cut off if the storage facilities were not available. An additional storage tank was added in 1943. The liquefaction operation consisted in compressing natural gas to a pressure of 600 lb/sq in. and removing carbon dioxide and moisture. By means of ethylene previously liquefied by ammonia refrigeration, the gas was then cooled to minus 132 F. The cooled and compressed gas was then permitted to expand in heavily insulated vessels to pressure of approximately 35-40 lb/sq in. Subsequent expansion, prior to transferring the liquefied gas into final storage tanks, resulted in a pressure of approximately 3 lb/sq in. and reduced the temperature to minus 275-250 F. In 1944 the most recently built storage sphere failed, spilling its contents and causing fires and explosions in which 128 people were killed. Seventeen safety recommendations concerning the structure and location of storage tanks are presented. It was concluded that the application of the system for liquefying and storing large quantities of natural gas is not invalidated, providing proper precautions are observed.

11758 APTIC NO. 28831

Shapiro, Robert, Bertram I. Cohen, and Robert E. Servis

SPECIFIC DEAMINATION OF RNA BY SODIUM BISULPHITE. *Nature, 227(5262):1047-1048, Sept. 5, 1970. 12 refs.*

Sodium bisulfite was used to deaminate the cytosine residues of yeast ribonucleic acid. The cytosine derivative was converted quickly by sodium bisulfite, at pH5, to an addition compound which readily deaminated, on standing, to the corresponding uracil addition compound. The latter was converted to uracil by adjustment of the pH to 9, and removal of excess bisulfite. Adenine and guanine derivatives do not react in this procedure. The RNA was separated from the bisulfite by chromatography on Sephadex G-25M. For analysis of composition, the RNA was hydrolyzed, neutralized, and cooled, with the quantitative amounts of each peak eluted from a column of Aberlite CG-400 resin being determined by a spectrophotometric method.

11759 APTIC NO. 28866

Dewitte, M., J. Vrebosch, and A. van Tiggelen

INHIBITION AND EXTINCTION OF PREMIXED FLAMES BY DUST PARTICLES. *Combust. Flame, 8(6):257-266, Dec. 1964. 18 refs.*

The inhibiting efficiency on premixed nitrogen diluted methane- oxygen flames of various powders, which differ in size and composition, has been investigated. A few measurements on propylene-oxygen flames have elucidated some special aspects of the inhibition process and, at the same time, have given further suppor to the statement that the mean molecular weight of the chain carriers depends on the nature of the fuel. Right from the beginning the various powders, chemically different but equally sized, were obviously to be classified into two groups: the more and the less efficient inhibitors. Later on, as was justified by measurements of temperatures and burning velocities, the latter were identified as 'thermal' inhibitors (e.g. alumina, aluminum sulfate, silica, cupric oxide, magnesium carbonate) acting mainly by means of a cooling effect, and the former as 'chemical' inhibitors (potassium chromate, potassium sulfate, potassium carbonate, potassium nitrate, potassium chloride, potassium bromide potassium iodide, sodium chloride), on the surface of which the chain carriers recombine. On the basis of equations derived from the gas kinetic and flame propagation theories, the critical concentration of a given powder, necessary for the complete extinction of a given flame, can be predicted.

11760 APTIC NO. 28879

THE GULF PROCESS OF HYDRODESULFURIZATION. *(Procede Gulf d'hydrodesulfuration). Text in French. Petrole Informations (Paris), 10(1156):43-44, 1970 (?).*

A new refining process named residual hydrodesulfurization (HDS) and first utilized on a commercial basis in 1970 is described. The HDS unit converts residual oils with a high sulfur content to fuels containing about 1% sulfur which are largely used for heating and i power plants. The decrease in sulfur results in greatly diminished air pollution. The most important element in the process is a new type of catalyst which is highly resistant to impurities such as the heavy metals contained in many charges. It was shown that the weight of particles suspended in the catalyst during the operation can amount to as much as 65% of the weight of the catalyst without appreciably decreasing its desulfurizing capacity. In operation, the incoming fuel charge is mixed with a gas which is rich in hydrogen, then heated and brought into the reactor containing the catalyst. The effluents of the reactor are passed through a high pressure separator from which the gaseous component is led through a purifier and recycled. The liquid is transferred to a low pressure separator and then to the fractionation system.

11761 APTIC NO. 28908

Rocchi, Bernardo

MOTOR KNOCK AND ANTI-KNOCK MIXTURES. *(La detonacion y mezclas antidetonantes). Text in Spanish. Rev. Aeronaut. (Madrid), vol. 3:364-365, May 1942.*

The 'knock' that occurs in an internal combustion motor is comparable in many ways to a true explosion, creating a pressure of 80 atmospheres with a speed of propagation of 300 meters per second. The history and present state of knowledge on the subject are reviewed. Four basic principles are involved: (1) proximity of the source of ignition (spark plug) to the firing chamber, (2) amount and nature of the turbulence existing in the firing chamber at the moment of ignition, (3) temperature and pressure of the fuel mixture at ignition, and (4) temperature of the walls of the firing chamber at ignition. Two approaches to the problem of motor knock are discussed: the addition of sizeable quantities of benzene, alcohol, or isooctane; and the addition of small quantities of a catalyst such as tetraethyl lead. Various formulas are presented and discussed, and the problems of using leaded gasoline are considered from the standpoint of motor efficiency and wear.

11762 APTIC NO. 28914

Ignat'yev, V. I., and N. I. Zverev

DEPOSITION OF AEROSOL PARTICLES ON A CYLINDER. *(Osazhdeniye chastitz aerozolya na tsilindre). Text in Russian. Inzh. Fiz. Zh., 3(12):17-23, 1960. 8 refs.*

Deposition of 10.3- to 238.5-micron anthracite particles at an air flow velocity of 0.53-126.70 cm/sec, or 9.5- to 79.5-micron metal particles at 2.01-97.60 cm/sec was studied in a 500 x 50-mm vertical wind tunnel, in order to determine the ratio between the number of particles collecting on the surface of a cylindrical obstacle to the number of particles swept past by the air stream. Analysis of experimental results reveals dependence not only on Stoke's Law of particle dynamics, but on several other criteria as well. This conclusion is also confirmed on the basis of particle-size and gas-viscosity effects at 600-700 C reported in the literature. Significant gravity effects were also noted.

11763 APTIC NO. 28989

Habashi, Faithi and Raymond Dugdale

THE ACTION OF SULFUR TRIOXIDE ON ELEMENTAL SULFUR. *Z. Anorg. Allg. Chem., 380(3):322-325, Feb. 1971. 8 refs.*

The reaction between elemental sulfur and sulfur trioxide is of technical importance as a way of producing pure sulfur dioxide suitable for liquefaction. This reaction was studied by introducing gaseous SO3 to a tube furnace containing sulfur melted under argon. The reaction between SO3 and sulfur increased with rising temperatures between 50 to 70 C. With increasing temperature, the rate of weight loss decreases gradually, reaching a minimum at 200 C, and then increased again. The decrease in rate at higher temperatures is considered to be due to the dissolution of SO3 in molten sulfur, then its decomposition according to: SO3 yields SO2 plus 1/2 02. Above 225 C, the rate of the reaction of sulfur with SO2 is negligible as compared to its rate of evaporation. The decomposition products of SO3 were withou action on sulfur from 70 to 275 C.

11764 APTIC NO. 28993

Nanda, Chitta R. and Gordon H. Geiger

THE KINETICS OF DEOXIDATION OF COPPER AND COPPER ALLOYS BY CARBON MONOXIDE. *Met. Trans., 2(4):1101-1106, April 1971. 22 refs.*

The kinetics involved in the gaseous reduction of oxygen from molten copper were studied by bubbling carbon monoxide through pure copper, copper-silver, or copper-tin baths containing dissolved oxygen. The solid-state electrolyte technique was used to detect the oxygen content of the bath. Liquid-phase mass transfer control is implied by the results for deoxidation in the range 0.05% oxygen down to 0.005%, where the chemical reaction rate is inferred to become significant in controlling the overall rate. Observed mass transfer coefficients were 0.04 to 0.30 cm/sec, depending on bubble size and alloy. The coefficients are in good agreement with Hughmark's mass transfer correlation. (Author abstract modified)

11765 APTIC NO. 29034

Cupitt, L. T. and G. P. Glass

CALCULATION OF ABSOLUTE CONCENTRATIONS OF SH AND SO FROM THEIR E.S.R. SPECTRA. *Trans. Faraday Soc., 67(577):1-6, Jan. 1971. 15 refs.*

Transition probabilities were calculated for several lines in the gas phase, X-band electron spin resonance spectra of SH and SO, and the results of the calculations used to estimate the absolute concentration of the two free radicals in the gas phase. The concentration of SO obtained in this manner was compared with the results of experimental measurements made by titrating mixtures of SO and atomic oxygen with nitrogen dioxide. Relative rate constants are given for the reaction of each radical with nitrogen dioxide. (Author abstract modified)

11766 APTIC NO. 29054

Laamanen, A.

A DESCRIPTION OF SOME OF THE FACILITIES AVAILABLE AT THE INSTITUTE OF OCCUPATIONAL HEALTH IN HELSINKI, FINLAND. *In: Research Facilities Necessary to Adeqautely Support Measurement of Low Levels of Pollutants and Follow Their Trends. Organization for Economic Co-operation and Development, Paris (France), Chapt. 4, p. 34-37, Sept. 22, 1970.*

The administration of the Institute of Occupational Health in Finland is unique in that the government owns the building and permits the semiprivate Board of Trustees, representing all important ministries and government authorities, as well as the private sector of employers and trade unions, to operate the facility. Under the Board are six departments: General (administration), Medicine, Physiology, Psychology, Industrial Hygiene, and the Department of Toxicology, Biochemistry, and Air Pollution. The government-controlled Coin Automation Association subsidizes about 30% of the annual budget; the other 70% is earned by the Institute's service work for state and private organizations. (In 1967, the total expenditure was approximately $1.5 million.) Air pollution represented about 60-65% of the work of the Depattment of Toxicology, Biochemistry, and Air Pollution. The staff of the Laboratory consists of 22 persons: 7 professional, 12 technicians, 2 office personnel, and 1 apprentice. The laboratory is in an urban setting 10 km from the center of Helsinki. Because the Department has a wide field of work, the equipment available is also used for analysis of biological specimens and is partly available for use in the activities of a pilot station. Sampling and analytical equipment is listed. Data processing services are available. Research work being undertaken concerns different urban and industrialized areas. The intention is to gather material from these areas to obtain as comprehensive a description as possible of basic chemical profiles of local air and its characteristics.

11767 APTIC NO. 29070

Hara, Hiroshi, Nagatoku Yamamoto, Koji Shimada, Hiroshi Yanai, and Takashi Shimizu

OXIDATION REACTION OF CARBON MONOXIDE BY SEMI-CONDUCTOR BARIUM TITANATE CATALYST. *(Handotai BaTiO3) shokubai niyoru CO sanka hanno ni tsuite). Text in Japanese. Preprint, Japan Society of Chemical Engineering, Tokyo, p. 255-257, 1971. (Presented at the Japan Society of Chemical Engineers Convention, Annual, 36th, Tokyo, Japan, April 2-5, 1971, Paper D205.)*

The catalytic oxidation reaction of caron monoxide was performed using barium titanate as a catalyst. Ferroelectric barium titanate can be converted into a semi-conductor by doping 0.2-0.6 mole % lanthan oxide. The resulting semi-conductor is a thermistor with positive temperature characteristics. During the caron monoxide oxidation reaction, the ratio of carbon monoxide and oxygen, and the reaction temperature were varied. The quantity of catalyst remained constant. The amount of lanthan oxide affected the reaction's yield, but not the reaction rate. Thus, the rate-determining step of the reaction was not changed by the number of active sites. The reaction did change at 380 C. Therefore, the rate-determining step is the surface reaction at temperatures above 380 C and the oxygen adsorbing process below 380 C. The sample's conductivity was measured in an atmosphere of carbon monoxide, oxygen, helium, carbon dioxide, or a mixed gas of oxygen and carbon monoxide. The adsorption of carbon monoxide and oxygen on the surface of the catalyst proceeded competitively at temperatures above 380 C, and the tightness of adsorption was almost equal. Carbon dioxide was not adsorbed. Therefore, the dominant factor affecting the reaction rate was the adsorbed oxygen, and the difference in adsorption state occurred because of the conductivity and properties of a ferroelectric substance.

11768 APTIC NO. 29082

Johar, R. S. and P. D. Scholtz

THE EFFECT OF AEROSOL TEMPERATURE AND PARTICLE NUMBER DENSITY ON LIGHT SCATTERING. *Atmos. Environ., 4(6):633-637, Nov. 1970. 2 refs.*

One candidate technique for studying the effectiveness of particle removal schemes in aerosols makes use of the scattered intensity from an incident laser beam. In the present investigation, the effect of aerosol temperature and number density on the scattered intensity from an incident beam laser was examined at a fixed angular position of Beta equals 30 deg. The ratio of the scattered intensity at 30 deg to the incident intensity was examined using an incident helium-neon laser beam and mechanically dispersed and electrically neutralized suspensions of aluminum oxide particles in air. Average particle diameter was six micron. At a fixed particle concentration of about 330 cu m, the scattered angular intensity ratio varied linearly with aerosol temperatures over the range 295-410 K. At 295 K, the scattered angular intensity ratio varied linearly with particle number density over the range 140 to 513 cu cm. (Author summary modified)

11769 APTIC NO. 29087

Ozaki, Atsumu and Ken-ichi Tanaka

CHEMISORPTION OF CARBON MONOXIDE ON FERRIC OXIDE: A TEST FOR THE ACTIVE SITE ON THE TRANSITION METAL OXIDES. *J. Catalysis, 20(3):422-423, March 1971. 4 refs.*

The adsorption of carbon monoxide on ferric oxide at room temperature and low pressure was studied as a function of evacuation temperature. The oxide was activated for initial rapid adsorption of CO by pre-evacuation above 200 C. When the oxide was cooled in an oxygen atmosphere after evacuation at 450 C, and evacuated again at 165 C for three hours, the adsorption measuremen showed no effect of oxygen. However, no adsorption occurred when the oxide was cooled in water vapor after evacuation at 490 C, and re-evacuated at 170 C for three hours. Thus, ferric oxide is activated for CO adsorption by dehydration from the surface. This means that there are exposed metal ions on the ferric oxide surface after the evacuation at high temperature.

11770 APTIC NO. 29092

Hasegawa, Masatomo and M. J. D. Low

INFRARED STUDY OF ADSORPTION IN SITU AT THE LIQUID-SOLID INTERFACE. III. ADSORPTION OF STEARIC ACID ON SILICA AND ON ALUMINA, AND OF DECANOIC ACID ON MAGNESIA. *J. Colloid Interface Sci., 30(3):378-386, July 1969. 28 refs.*

Infrared spectra were recorded in situ as long-chain fatty acids adsorbed onto oxides from carbon tetrachloride solution. Only physical adsorption occurred on silica, stearic acid adsorbing predominantly as monomers at low concentration. Adsorbed stearic acid dimers were also formed at higher concentrations. The predominant reaction of stearic acid with alumina was formation of a layer of stearate and adsorbed water. The arrangement of stearate chains in the surface layer was irregular. Adsorbed stearic acid dimers were observed at high coverage. The main reaction of magnesia with decanoic acid solution was the formation of a surface decanoate layer with the production of perturbed hydroxyl groups. The packing of the hydrocarbon chains in the decanoate layer was fairly regular. Adsorbed decanoic acid dimers occurred at higher coverages, the dimers, being arranged much like those in solid decanoic acid. There were probably two adsorbed species. In contrast, when decanoic acid was adsorbed on magnesia through the gas phase, the decanoate layer was less well oriented and the adsorbed dimers had no regular orientation but were deposited randomly over the surface. (Author abstract modified)

11771 APTIC NO. 29110

Poersch, W. and H. Neef

EXERGY OF VAPOUR/GAS MIXTURES. *Chem. Process. Eng., 52(3): 52-57, 60, March 1971. 37 refs.*

With the help of the available energy or exergy it is possible to make a uniform assessment of all forms of energy (heat, 'cold', mechanical and electrical, potential and chemical energy). In exergetic analyses, the point where losses occur is located; an improvement in the thermodynamic process often means a lowering of cost. Exergy has already found wide application in optimizing work and power processes and in the design of heat exchangers. The method can also be applied to plants operating with ideal and real vapor/gas mixtures. With water/air mixtures as an example, methods of calculation and generally valid graphs are shown that make it possible to investigate a wide range of processes--drying, scrubbing, absorption, distillation, HO cation.

11772 APTIC NO. 29137

O Reilly, D. E., F. D. Santiago, and R. G. Squires

PARAMAGNETIC RESONANCE AND PHOSPHORESCENCE OF CHROMIA-SILICA CATALYST WITH CHEMISORBED OXYGEN. *J. Phys. Chem., 73(9): 3172-3174, Sept. 1969. 3 refs.*

The paramagnetic resonance of chromia (0.53 wt% Cr) dispersed on a high surface area silica aerogel was studied as a function of oxygen pressure over the system which had been reduced in hydrogen at 500 deg. Electron paramagnetic resonance spectra of the catalyst were generally taken at -180 C to suppress the resonance of the Beta-phase and allow precise measurements on the gamma-phase signal. EPR first derivative spectra are shown. A peak in the derivative at 1500 G is due to the delta-phase chromium. The intensity of this peak decreses with increase in oxygen pressure in the range of 20-2400 micron oxygen. The gamma-phase resonance consisted of two partially resolved components: gamma phase (stable) and gamma phase (unstable). The former remained constant in intensity, while the intensity of the latter decayed exponentially with time for initial oxygen pressure. A red phosphorescence of the sample was observed following addition of oxygen at pressures of several Torr. The effect was not observed when the sample was exposed to oxygen at -196 deg. Two sharp lines that appeared at oxygen pressures above 250 micron are tentatively ascribed to 02 or 0- on the surface.

11773 APTIC NO. 29138

Cusumano, J. A. and M. J. D. Low

INTERACTIONS BETWEEN SURFACE HYDROXYL GROUPS AND ADSORBED MOLECULES. II. INFRARED SPECTROSCOPIC STUDY OF BENZENE ADSORPTION. *J. Phys. Chem., 74(9):1950-1956, April 30, 1970. 16 refs.*

Infrared spectra were recorded of benzene adsorbed on porous glass which had been dehydroxylated to various extents and of benzene adsorbed on deuterated and fluoridated porous glass and on silica. A specific adsorbate-adsorbent interaction was observed, the pi systems of the adsorbed benzene molecules interacting with the surface hydroxyls. At low degrees of coverage the B-OH....pi interaction predominates, the Si-OH...pi interaction becoming important only at higher coverage.

11774 APTIC NO. 29150

Hurley, A. C.

AUGER SPECTRA OF CO AND LONG-LIVED STATES OF CO++. *J. Chem. Phys., 54(8):3656-3657, 1971. 10 refs.*

Potential energy curves are presented for ground state dissociation products of CO(2+) and a partial assignment provided for the Auger spectra of CO. From the partial assignment of the Auger spectra it is concluded that the potential energy curve for the ground electronic state of CO(2+) possesses a substantial (greater than 0.5 eV) local minimum which supports at least five vibrational levels. Although this contradicts the recent conclusion of Newton and Sciamanna, it may be reconciled with their experimental findings since the Frank-Condon factors governing the primary excitation process could lead to a preferential population of the highest vibrational levels. Such a preferential population is to be expected from the form of the energy curve for the X 3II state of CO(2+) and is consistent with the observed relative intensities in the Auger spectrum.

11775 APTIC NO. 29166

Blyholder, G. and R. Sheets

THE PLATINUM-CARBON STRETCHING FREQUENCY FOR CHEMISORBED CARBON MONOXIDE. *J. Phys. Chem., 74(25):4335-4338, 1970. 22 refs.*

A grating spectrometer was used to obtain the infrared spectra of carbon monoxide chemisorbed on platinum deposited in a hydrocarbon oil film on the salt windows of an evacuated infrared cell. The infrared spectra produced bands at 2045, 1815, and 480 reciprocal cm. The band at 480 reciprocal cm, about which there has been considerable controversy in the literature, was clearly established on the basis of background spectra before adsorption of CO and observations of the isotope shift. Comparison of the observed isotope shift with calculated shifts for stretch and bend indicated that the 480 reciprocal cm band represents the PT-C stretching mode. In addition, the isotope shifts support a linear Pt-C-O model with the carbon atom attached to the Pt. From changes in the appearance of the evaporated films concurrent with changes in the intensity of the 1815 reciprocal cm band, it is suggested that this band is due to CO on highly dispersed Pt. Addition of oxygen produced a band a 560 reciprocal cm which is assigned as a surface oxide. (Author abstract modified)

11776 APTIC NO. 29224

Tang, I. N., H. R. Munkelwitz, and A. W. Castleman

SO2-METAL ION CLUSTERS. *Nature Phys. Sci., 230(16):175-176, April 19, 1971. 7 refs.*

The synthesis and identification of sulfur dioxide-metal ion clusters which do not contain hydrogen atoms are reported. Experimental apparatus consisted of an iron source and a reaction cell, both of stainless steel and equipped with cooling water jackets. Sodium ions were emitted from a heated bead of sodium aluminum silicate. The ions leaving the source were focused into the reaction cell which was 1 cm in depth and contained no electrical field. Nitrogen, which served both as carrier gas for introducing reactants and as moderator for thermalizing the input ion beam, was continuously metered into the cell. The total pressure of the system was maintained at 4 torr. After reaction, the ions and ion clusters, which drifted out of the cell into vacuum through a 100 micron leak orifice, were extracted and focused into a quadrupole mass spectrometer for mass identification.

11777 APTIC NO. 29225

Morterra, Claudio and M. J. D. Low

REACTIVE SILICA. III. THE FORMATION OF BORON HYDRIDES, AND OTHER REACTIONS, ON THE SURFACE OF BORIA-IMPREGNATED AEROSIL. *J. Phys. Chem., 74(6):1297-1302, March 19, 1970. 22 refs. Part I. Ibid., vol. 73, p. 321, 1969. Part II. Ibid, vol. 73, p. 327, 1969.*

The activation of boria-impregnated Aerosil by a methylation-pyrolysisdegassing procedure was studied by infrared techniques. The spectra showed that the surface structures related to the silica portion of the composite adsorbent, and their reactions were entirely like those previously described for reactive silica prepared from pure Aerosil; a second set of structures and reactions was related to the boria portion of the surface. the pyrolysis of B-OCH3 groups leads to the formation of three surface species absorbing at 2621, 2601, and 2580/cm. Removal of these boranes by high-temperature degassing then leads to the formation of reactive boria dispersed on the surface of the reactive silica. The nature of the surface, and its reaction with hydrogen, water, and oxygen, are discussed. (Author abstract)

11778 APTIC NO. 29258

Rosauer, Elmer A.

POZZOLANIC REACTIONS IN SYNTHETIC FLY ASH. (FINAL REPORT). *Iowa State Univ. of Science and Tech., Ames, Engineering Research Inst., Contract NSF*

GK 1405, ISU-ERI-Ames-84600, ERI Proj. 683-S, 21p., Aug. 1970. 11 refs.

NTIS: PB 194 906

Synthetic fly ash of known particle size, glass content, and chemical composition was prepared from coal-associated minerals (kaolinite, pyrite, and calcite which form over 95 wt% of the mineral matter in coal) under conditions closely approximating those in suspension-fired furnaces. Thermal history of the particles played a prominent role in determining pozzolanic reactivity. Although particles cooled at a slow rate contained less glass than those quenched at a rapid rate, the difference in glass content was not sufficient to explain the large reduction in pozzolanic reactivity, which may instead relate to reduction in residual strain by annealing. X-ray, light microscopic, and chemical analyses showed that pyrite added to kaolinite for production of synthetic fly ash gives rise to hematite and magnetite; calcite gives rise to calcium hydroxide and calcium carbonate. Pyrite and calcite also influence the glass composition to some extent. Of secondary importance in regard to pozzolanic strength and activity is fineness of fly ash particles. Provided the glass is highly strained or vitrified, the finer particles are more reactive. The chemical composition of the ash is of less significance. Iron, aside from its dilution effect, reduces pozzolanic reactivity of the glass while calcium increases it. However, calcium, which may be added to control sulfur emissions, tends to offset the deleterious influence of iron. The rate of pozzolanic reaction in synthetic fly ash was similar to those of portland cement mortars and industrial fly ash mortars. (Author abstract modified)

11779 APTIC NO. 29263

Jackson, A.

PURIFICATION OF GASES FROM PYRITES ROASTING. *In: Gas Purification Processes. G. Nonhebel (ed.), London, George Newnes Ltd., 1964, Chapt. 13, Part A, p 524-536.*

Gas cleaning plants for two variations of flash roasting, and hearth roasting without waste heat recovery are discussed. The choice of flash roasting variations depends upon equipment construction, and whether the weak sulfuric acid produced in the first variation, can be used elsewhere, for example in superphosphate manufacture, or whether the liquor produced by the second variation, a once-through system, is a disposal problem. The first variation of flash roasting also has the greater possibility of recovering valuable dust in separate fractions in the dry state, but is a more costly process. The purification problem after hearth roasting is easier than that from flash roasting, since there is only about one-fifth as much dust in the gas. Arsenic-rich pyrites require two stages of mist precipitation to produce arsenic-free concentrated acid, another important difference. Because of the suction conditions on all the gas cleaning schemes shown, and because of the danger of localized cooling with sulfate formation, extreme care is necessary in constructing gas cleaning equipment in order to reduce air in-leakage to a minimum. Two methods of testing for leakage, one using ammonia and hydrocholoric acid, the other using ammonia and test paper, are recommended. Warning devices to give indications of momentary abnormalities in temperature and pressure are discussed. True cost comparisons of the various types of gas cleaning, including dust removal equipment, are difficult to obtain, as the costs of foundations or supporting structures and connecting equipment vary widely.

11780 APTIC NO. 29264

Sobolev, Ye. P., I. A. Rubinshteyn, M. S. Smirnov, and G. G. Koznov

LABORATORY DETERMINATION OF THE SCALE-FORMING PROPERTIES OF DIESEL FUELS. *(Laboratornyy metod otsenki nagaroobrazuyushchikh svoystv dizelnykh topliv). Text in Russian. Khim. i Tekhnol. Topliv i Masel, no. 9:54-55, Sept. 1968. 4 refs.*

The possibility of evaluating the scale-forming properties of diesel fuels as a function of maximum sootless flame height was demonstrated. It was found that scale-forming by diesel fuels is related to a cyclicity coefficient which is defined as the ratio of percent content of carbon contained in aromatic rings to the percent content of carbon in paraffin structures. Data are tabulated for a number of different fuels.

11781 APTIC NO. 29268

Kleitz, M., C. Deportes, and P. Fabry

THE ELECTROCHEMICAL OXYGEN PUMP; ITS APPLICATION TO THE GENERATION OF A CONTROLLED ATMOSPHERE. *(La pompe electrochimique a oxygene; application a la generation d atmosphere controlee). Text in French. Rev. Gen. Thermique (Paris), 9(97):15-25, Jan. 1970. 8 refs.*

The electrolyte fuel cell is discussed in terms of its function as an electrochemical oxygen pump. A fuel cell using a solid electrolyte such as zirconium or thorium oxide makes use of reactions that tend to enrich one side of a partition with oxygen while impoverishing the other side, so that it has the effect of pumping oxygen from one side of a partition to the other. One application of this principle is in the field of atmosphere control. The theoretical basis and general characteristics of the device are discussed, and a practical embodiment of the idea is presented, in the form of an electrochemical oxygen pump-gauge. The two models shown are capable of delivering a gas flow of 0.1 and 10 liters per hours, respectively, operating in the temperature range of 700-1200 C.

11782 APTIC NO. 29271

Lindauer, George C. and A. W. Castleman, Jr.

ON THE INITIAL SIZE DISTRIBUTION OF HIGH NUMBER DENSITY AEROSOLS. *Trans. Am. Nucl. Soc., 12(2):897, Nov. 1969. 6 refs.*

Computer calculations were performed for plutonium dioxide and uranium dioxide aerosols having initial log-normal distributions with a geometric mean radius from 20 to 100 A and the constant, sigma, from 1.5 to 2.5 in a basic aerosol equation. Initial mass concentrations and number densities were 0.01 to 100 microgram/cu m and 10 to the ninth power to 10 to the 14th power particles/cu cm, respectively. Prior to times when particle removal becomes significant, the number density distribution remained very close to log-normal with sigma rapidly leveling off to values between 1.34 and 1.40 for all cases. Thus, for the purpose of calculations, the initial size distribution of high mass concentration aerosols can be approximated by a log-normal distribution with sigma of 1.37. This leads directly to a specific geometric mean radius which is only a function of mass concentration. The significance of this finding for fast reactor accidents is indicated.

11783 APTIC NO. 29285

Stupfel, Maurice and Andre Roussel

THE INFLUENCE OF SEX IN THE RATE OF DEATH CAUSED BY HYPOXIA, CONFINEMENT AND CAR-

BON MONOXIDE. *(Influence du sexe sur la mortalite par hypoxie, confinement et oxyde de carbone). Text in French. Compt. Rend. Soc. Biol. (Paris), 163(2):310-313, 1969. 6 refs.*

Three groups of experiments were conducted with male and female mice and rats to determine death rates in a confined sealed space. On the average the females showed considerably greater percentages of survival than the males. The animals separated in batches of same sex, equal age, and equal weight. In the first series of experiments, the animals used up the available atmosphere and re-inhaled their exhaled air. Death of the mice occurred after 53 hours, with the oxygen content down to 5% and the carbon dioxide from exhalation up to 13%. Seventy percent of the male and 35% of the female mice were dead at that stage. In a similar experiment with rats, all of the males and 88% of the females were dead after 12 hours, again at 5% oxygen and 13% CO2 content inside the box. In the second experimenal series, lime granules were placed in the box for absorption of the CO2. Fifty percent of the male mice and 40% of the female mice died after 15 hours, with the oxygen down to 4%. In an analogous experiment with rats 83% of the males and 73% of the females died after 3 hours, when the oxygen content reached 4%. The third group of experiments was conducted with mice only in a closed atmosphere to which 0.33% carbon monoxide was added. After about 30 minutes, 55% of the males and 6% of the females died. Among animals of the same sex in groups I and II, those of heavier body weight showed a better survival rate than the light ones.

11784 APTIC NO. 29290

Takao, Satoshi, Yoshihiko Hatano, and Shoji Shida

WATER FORMATION IN THE GAS PHASE RADIOLYSIS OF NITROUS OXIDE- HYDROCARBON MIXTURES. *Bull. Chem. Soc. Japan (Tokyo), 44(3):873, 1971. 9 refs.*

Studies of the effects of hydrocarbons on the gas-phase radiolysis of nitrous oxide showed that the addition of small amounts of hydrocarbons to N20 caused a sudden decrease in the nitrogen yield and a large increase in the yield of oxygen-containing products. In all cases, water was the major product with small amounts of alcohols or carbon monoxide. Partly on the basis of the observed decrease in nitrogen yields in the presence of hydrocarbons, it is concluded that nascent oxygen plays a major role in the nonionic decomposition of N20.

11785 APTIC NO. 29292

Fontijin, Arthur and Roy Ellison

MECHANISM OF THE CHEMILUMINESCENT EMISSION OF THE CO FOURTH POSITIVE BANDS IN ACTIVE NITROGEN/CO MIXTURES. *J. Chem. Phys., 54(8):3649-3651, 1971. 11 refs.*

An attempt was made to define the reaction mechanism responsible for the spectral distribution and intensity of carbon monoxide Fourth Positive bands in the nitrogen/carbon monoxide system. The study was performed at 1-10 torr and room temperature in a microwave flow discharge system. Some representative results and flow conditions are graphically illustrated. The proposed reaction scheme, based on an energy transfer mechanism and excluding direct quenching, is in qualitative agreement with 10 torr observations but inadquate for explaining the lower pressure experiments. Reasons for the differences are discussed and proposals made for modification of the reaction scheme.

11786 APTIC NO. 29303

Shimizu, Takashi, Hiroshi Hara, Kooji Shimada, Osanori Yamamoto, and Hiroshi Yanai

CATALYTIC OXIDATION OF CARBON MONOXIDE ON SEMICONDUCTIVE BARIUM TITANATE. *(Handotai chitansan baryumu niyoru issanka tanso no sesshoku sanka). Text in Japanese. Kogyo Kagaku Zasshi (J. Chem. Soc. Japan), 74(5):825-828, May 1971. 10 refs.*

Special grade barium carbonate and titanium dioxide of the anatase type were weighed, added by ion exchange to water, and blended for four hours in a bowl mill. Lanthanum chloride and ammonia were als added until pH equaled 9. The precipitate was filtered, water rinsed, and dried. After compacting in a steel die, the barium titanate semi-conductor was sintered at 1300-1400 C in air. The catalyst was ground to 20-60 mesh, 20-30 g of which filled a reactor tube. Then a carbon monoxide and oxygen mixture of 2:1 was supplied at the rate of 3500 ml/hr. An elevated temperature gas chromatograph was used for the analysis with hydrogen as a carrier. For the electroconductivity measurement, silver electrodes were baked onto the sintered specimen, which was placed at the center of the tube. The catalyst activity was dependent on the amount of lanthanum oxide used for semiconductorization. The activity was optimized at 0.3 mol% lanthanum oxide, and the electroconductivity was optimized by the addition of the same percentage of lanthanum oxide. The conductivity increased with the introduction of carbon monoxide, and decreased with oxygen. By the electroconductivity measurement above the curie point for the n-type semiconductor catalyst, the interface barrier was lowered by the adsorption of the positive charges of carbon monoxide. Oxygen was interpreted to reversely adsorb. Further study on the reaction mechanism is being made.

11787 APTIC NO. 29319

Koziorowski, Cz., T. K. Nowakowski, and M. Przystawa

LUNG VENTILATION INDEX CHANGES DURING SEXUAL MATURITY. *(Die Veraenderung des Indexes der Lungenventilation waehrend der Geschlechtsreife). Text in German. Aerztl. Jugendkunde, 61(3):167-168, 1970.*

The lung ventilation index in growing children increases by jumps with increasing body weight. Since the lung ventilation index, a measure of the capacity of the respiratory system, manifests a number of changes which characterize certain developmental stages, the vital capacity (VC) and the time required for the expiration of the first liter of vital capacity (tl FVC) of 570 healthy normal children divided into six age groups was determined. The percentage increases of VC and of tl FVC from one group to the next were determined by statistical evaluation of the measuring results. From the 11th year on, a certain developmental parallel between sexes is discernible with the lung ventilation index of girls increasing faster than that of boys. From the 14th year of age on, the increases in boys persist at a high rate while in girls they diminish. This indicates that in girls the development of vital capacity has ended while that of boys is still developing. Ventilation is directly related to body weight increase intensity in one and the same population. The weight gain is a reflection of the increase of the muscular mass which governs expiration under stress. In girls between the ages of 12 and 14, a significant weight gain is not accompanied by improved expiratory capacity, on the contrary expiratory capacity decreases.

11788 *APTIC NO. 29338*

Yanagihara, Shigeru

IRRADIATION TEST OF AUTOMOTIVE EXHAUST. (Jidosha haikigasu no kokagaku hanno no jikken). Text in Japanese. Jidosha Gijutsu (J. Soc. Automot. Engrs. Japan), 25(3):283-289, March 1971. 5 refs.

The photochemical reaction of automotive exhaust was analyzed by an irradiation test using a smog chamber. The exhaust gas discharged from an engine operated in actual running patterns was diluted with clean air to one to several thousanths to simulate atmospheric density, and ultra-violet irradiation was applied. As the irradiation began, with oxidation of nitric oxide t nitrogen dioxide accelerated, resulting in a rapid increase of NO2. The oxidant rapidly increased after a considerable amount of NO was transformed into NO2. Hydrocarbons began to decrease greatly with the start of the irradiation and continued to decrease as long as the oxidant increased with a continuing decrease of NO2. It was assumed that the oxidant began to accumulate after NO was oxidized to form NO2. Although alkyl nitrate and peroxyacetylnitrate, are formed from the dissociation of NO2 into NO and oxygen caused by ultraviolet rays, the very beginning of this process should be traced back to the transformation of NO to NO2. The effect of the HC/NOx ratio on the photochemical reaction was examined. The result indicated that the HC/NO ratio and its HC activity are related significantly with the reaction speed but only slightly with the maximum value of the oxidant. The initial density is the determining factor for the maximum value of the oxidant. The effect of the intensity of the irradiation on the formation of the oxidant was also examined. Results showed that the oxidant increases with an increase in the irradiation energy over a period from the initial stage of the reaction to a considerably late stage. The effect is more conspicuous in the earlier stage of the reaction but the density of the oxidant still increases proportionally to that of the irradiation energy even after irradiation of 2-5 hours.

11789 APTIC NO. 29340

Seleznev, V. A., A. A. Kadushin, and S. Z. Roginskii

BRIDGING AND LINEAR STRUCTURES OF CHEMOSORBED CARBON MONOXIDE. *Dokl. Phys. Chem. Sect. (English translation from Russian of: Doklady Akad. Nauk SSSR), 194(4-6):755-757, Oct. 1970. 6 refs.*

Infrared spectroscopy was used to study the structure of carbon monoxide chemosorbed on nickel oxide-magnesium oxide solid solutions in the range of NiO concentrations from 8.0 to 1.0 mole %. Thermal decomposition of mixed hydroxides of nickel and magnesium gave NiO-MgO solutions. Carbon monoxide was adsorbed at a pressure of 30 torr. After 15 minutes, the absorption band positions for CO were almost the same in all the solid solutions. After 18 hours, the intensities of the absorption bands increased. Carbon monoxide was not adsorbed on magnesium ions. The production of chemosorbed forms of CO does not depend on the existence of a continuous NiO lattice and the dilution of NiO in MgO leads to a decrease in the integral intensities of all the absorption bands. Surface compounds formed by CO adsorption have two structures -- linear and bridging. The spectra show that absorption bands in the range 1800 to 2100/cm are due entirely to the linear structure of adsorbed CO. The surface nickel ions in NiO-MgO solid solutions cannot form a pi bond with neighboring metal atmos, since the oxygen and magnesium surrounding them do not have d electrons.

11790 APTIC NO. 29365

Yamanaka, Shinichi, Kai Hirose, and Senzo Kawai

REACTION OF ETHYLENE AND PROPYLENE, TO INCREASED LIGHT BY SULFURIC ACID GAS. *(Aryusan gasu ni yoru echiren, purobiren no hikari zokan hanno). Text in Japanese. Preprint, Japan Chemical Society, Tokyo 1p., 1971. 1 ref. (Presented at the Japan Chemical Society Annual Meeting, 24th, Tokyo, March 1971, Paper 3336.)*

Sulfuric acid gas and nitrogen gas for dilution were prepared and the nitrogen dried with phosphorus pentoxide after elimination of the oxygen. Pure ethylene and propylene were used. Using a static method, the sulfuric acid gas and lower grade hydrocarbon concentrations before and after exposure to a 100 W high pressure mercury light were measured. Sulfuric acid gas was taken into a 100 mm absorbing cell, and the degree of light absorption at 286 micron was measured. There was no direct reaction between ethylene or propylene with sulfur dioxide. Sulfur dioxide itself breaks down, but the details are not known. A partial absorption band of propylene occurs at a low wavelength and partial breakdown also occurs. With the addition of SO2, the rate of decrease for ethylene and propylene increases. Gas chromatography peaks corresponding to other hydrocarbons were detected. The amount of decrease in ethylene and propylene is not equal to that of SO2, and the decrease of SO2, which is supposed to break down directly, is small. It is possible that sulfuric acid and other compounds containing sulfur and oxygen, oxides from the oxygen generated by the breakdown of SO2 and, by the hydrocarbon, by the light increase sensitivity reaction may be generated. There is not much possibility of sulfur and oxygen compounds or oxides being detected by gas chromatography. Therefore the likely substance is a low chain hydrocarbon.

11791 APTIC NO. 29394

Subramanyam, K. and M. R. A. Rao

ADSORPTION OF HYDROGEN AND CARBON MONOXIDE AND THEIR MIXTURES ON IRON FISCHER-TROPSCH CATALYSTS. PART II: ADSORPTION FROM MIXTURES OF HYDROGEN AND CARBON MONOXIDE ON PROMOTED AND UNPROMOTED IRON CATALYSTS. *J. Res. Inst. Catalysis, Hakkaido Univ., 18(3):124-141, Dec. 1970. 7 refs. PART I. Ibid., 18(3):115-123, Dec. 1970.*

Adsorption studies of hydrogen and carbon monoxide on alkali promoted and unpromoted iron catalysts were conducted with 1H2:1CO, 1H2:2CO, and 2H2:1CO mixtures using a thermal conductivity meter for analysis. Kinetic studies indicated that initially adsorbed H2 was partly displaced by CO below 53 deg C. At higher temperatures, the displacement of H2 did not occur. The amounts of adsorbed H2 and CO increased concomitantly with all three mixtures. Equilibrium studies showed that as temperature increased, the amount of H2 adsorbed also increased, but the increase in the adsorption of CO was less prominent. On the unpromoted catalyst, at 97 deg C, the H2:CO ratio in the adsorbed phase was 1:1.4 with the 1H2:1CO and 1H2:2CO mixtures but was 2:1 1:2 with all the mixtures on the promoted catalyst. The higher adsorption of CO with the promoted catalyst is responsible for the differences in the behavior of the catalysts in Fischer Tropsch synthesis. A surface complex is formed initially on both the catalysts, and this complex initiates the reaction. (Author abstract modified)

11792 APTIC NO. 29395

Lapujoulade, Jean

THE COOPERATIVE CHEMISORPTION OF HYDROGE AND CARBON MONOXIDE ON TH (111) FACE OF A NICKEL SINGLE CRYSTAL. *(Chimisorption cooperative de l hydrogene et de l oxyde de carbone sur la face (111) du nickel). Text in French. J. Chim. Phys., 68(1):73-79, Jan. 1971. 9 refs.*

The flash desorption technique was used to study the cooperative chemisorption of hydrogen and carbon monoxide on the (111) face of a nickel single crystal. During the first stages, the two gases are adsorbed independently and the previously found results for H2 adsorption on polycrystalline nickel are obtained again. As the adsorption proceeds, CO partially replaces H2 on the surface resulting in a decrease of H2. Then the two gases form a new surface complex and, finally, the H2 increases. The binding energy of H2 decreases with increasing population when there is no interaction with CO. When the complex hydrogen-carbon monoxide is formed, this energy is constant and equals 15.5 kcal/mole. The evolution of the corresponding binding energy of CO is discussed.

11793 APTIC NO. 29400

Inouye Toshiyuki and Yasuo Ito

GENERATION AND QUANTITATIVE ANALYSIS OF MIXED AEROSOL OF TWO COMPONENTS. *(2-seibunkei kongo eazoru no hassei narabini teiryo). Text in Japanese. Preprint, Japan Chemical Society, Tokyo, 1p., 1971. (Presented at the Japan Chem. Soc. Annual Meet., 24th, Tokyo, March 1971., Paper 3404.)*

An evaporation method was adopted to generate aerosols, and the relationship between the heating temperature and the aerosol concentration was studied. A mixed aerosol of two components was also generated, and the proportion of components and conditions for varying the degree of concentration investigated. Chlorides such as lead and cadmium, which melt at comparatively low temperatures were used as samples. The sample was placed in a porcelain tube 5 mm inner diameter, which was then hung in the center of a vertical tube furnace whose temperature was kept constant. Air was sent in continuously from the bottom in order to melt and evaporate the sample. The generated aerosol was passed to a tank. The two-component aerosol was prepared by placing lead chloride and cadmium chloride, generated separately, into the mixing tank. The aerosol concentration in the atmosphere was impinged, at 3 l/min an measured by light absorption using diphenylthiocarbazone. When the solids are melted and evaporated and the aerosol is generated by natural cooling, one of the conditions for obtaining a uniform concentration is to maintain the evaporation rate. A deep vessel, with a small evaporation surface, is suitable and can supply a certain required concentration of aerosol for a long period of time The uniformity of the aerosol concentration is also influenced by temperature; therefore, it is necessary to maintain a constant temperature. When the temperature is higher than the melting point of that sample, the aerosol concentration increases with temperature. For lead chloride and cadmium chloride, there is an inverse correlation between the aerosol concentration and temperature (l/T). When the aerosols of lead chloride and cadmium chloride are mixed at 10%-90%, it was shown that a mixed aerosol of two components can be continuously generated, regardless of the mixing ratio, over a long time period.

EFFECTS-HUMAN HEALTH

11794 APTIC NO. 27265

Hanks, Thrift G.

HUMAN PERFORMANCE OF A PSYCHOMOTOR TEST AS A FUNCTION OF EXPOSURE TO CARBON MONOXIDE. *Ann. N. Y. Acad. Sci., 174(1):421-434, Oct. 5, 1970. 16 refs.*

With considerations of motor vehicle safety in mind, investigation of a psychomotor control function and of carbon monoxide uptake under conditions of human exposure to low levels of CO were undertaken. Nonsmoking healthy young male college students were exposed to levels of 0, 25, 50, 75, and 100 ppm of CO on each of two series of runs. Breath samples were measured for CO content before and at approximately half-hour intervals during exposure, immediately following psychomotor testing. Exposures lasted about 4 1/2 hours. Blood carboxyhemoglobin level was determined by gas chromatography at the end of a run once for each subject, providing four determinations at each CO chamber concentration. The critical tracking test is described as a test of increasing difficulty that pertains to the driver's ability to maintain control. No effect on performance of the CTT attributable to CO exposure was found.

11795 APTIC NO. 27267

Dinman, B. D., J. W. Eaton, and G. J. Brewer

EFFECTS OF CARBON MONOXIDE ON DPG CONCENTRATIONS IN THE ERYTHROCYTE. *Ann. N. Y. Acad. Sci., 174(1):246-251, Oct. 5, 1970. 16 refs.*

In view of the leftward shift of the oxyhemoglobin curve induced by carbon monoxide, possible interactions of the right shift associated with 2,3-diphosphoglycerate alterations were examined. Twelve human volunteers were given doses of CO calculated to produce 15 to 25% carboxyhemoglobin. Prior to exposure to CO, red cell DPG was determined by use of a chromatropic acid method, and this determination was repeated six hours after the first dose of CO. In addition, 42 rats were exposed to approximately 0.8% CO for ten to 15 minutes. Twenty-two rats of this group were dosed every hour for five hours, while another group was dosed once at zero time and again at three hours. The rats given the two doses of CO three hours apart had a significantly elevated level of DPG. With the human subjects, the change in DPG levels was apparently related inversely to peak carboxyhemoglobin concentration. Blood pH and other variables which affect DPG levels are discussed.

11796 APTIC NO. 27271

Reichel, G. and W. T. Ulmer

INFLUENCE OF THE SEASONAL CHANGES OF AIR POLLUTION AND OF WEATHER-FACTORS ON THE INCIDENCE OF CHRONIC NON SPECIFIC RESPIRATORY DISEASES. *(Einfluss des jahreszeitlichen Wechsels der Luftverunreinigung und der Wetterfaktoren auf die Haeufigkeit chronisch unspezifischer Atemwegserkrankungen). Text in German. Arbeitsmedizin, 27(1-2):130-154, 1970. 73 refs.*

From 1965 until June 1966, the influence of atmospheric sulfur dioxide and dust concentrations, as well as of temperature and humidity, on the frequency of non-specific airway diseases was investigated in 1292 randomly selected men and 843 women. The incidence of cough, expectoration, and dyspnea upon exertion in the months of October to January-February 1965/66 were above the general average. Characteristic of these months with increased frequency of subjective symptoms of bronchitis was an air humidity above the average as well as increased dust and SO2 concentrations at low outside-air temperatures. The comparison of objective measuring values, for example, oxygen pressure, intrabronchial flow resistance, and the proportion of increased bronchial resistance, did not reveal any indication to assume that with the increase of dyspnea and cough, an increase of obstructive bronchial diseases or other functional lung disturbances must occur. The same findings resulted from single analysis by means of a multiple regression. Evidently, there did not result any bronchoconstrictive disorder from the acute changes of the SO2 and dust occurring in Duisburg in the years 1965/66, nor were the gas exchange conditions within the lungs affected. Just as in case of occupational dust-burdening, there is, up to now, no evidence that the acute irritation of the upper airways by atmospheric or climate factors, leading to an increased incidence of cough, expectoration and dyspnea, graduates into the chronic obstructive bronchitis.

11797 APTIC NO. 27286

Melandri, C. and V. Prodi

SIMULATION OF THE REGIONAL DEPOSITION OF AEROSOLS IN THE RESPIRATORY TRACT. *Am. Ind. Hyg. Assoc. J., 32(1):52-57, Jan. 1971 10 refs.*

A device is described that simulates behavior of the airways as far as deposition is concerned. The main section consists of a sieve-plate water column into which the aerosol is injected and rises in uniform bubbles. Deposition of aerosol particles in these bubbles closely follows, in the 0.02 to 5 micron range, the total deposition curves of the respiratory tract. Pulmonary deposition has been simulated by adding before the column a properly designed stage with a capture efficiency close to the deposition efficiency in the nasopharyngeal plus tracheobronchial regions. In addition, this device has the property of inducing hygroscopic growth where appropriate, thus simulating the respiratory tract with respect to particle size increase. Tests have been performed with particles of polystyrene, iron oxide, and sodium chloride, and curves have been plotted for efficiency versus particle diameter. The point of minimum efficiency occurs around a few tenths of a micron, and separates in each case the region where Brownian diffusion effects prevail from the region where inertial and gravitational effects prevail. In the latter region, the deposition efficiency is significantly different for the three materials used; in the cases of Fe203 and polystyrene, the difference in behavior is due to density difference, while in the case of NaCl one has to consider that inside the bubbles the humidity is high enough to cause nucleation and growth of particles into droplets. (Author abstract modified)

11798 APTIC NO. 27287

Palmes, E. D. and Chiu Sen Wang

AN AEROSOL INHALATION APPARATUS FOR HUMAN SINGLE BREATH DEPOSITION STUDIES. *Am. Ind. Hyg. Assoc. J., 32(1):43-46, Jan. 1971. 4 refs.*

Several modifications of an apparatus for measuring the fraction of inhaled particles deposited in the respiratory tract in a single breath have been constructed. These have been used for studying the effects on deposition of such variables as particle size, degree of lung inflation, depth of breathing, and breath holding time. To reduce the demands on patients with chronic obstructive lung disease, an apparatus was constructed consisting of a three-way valve system and anesthesia bags to contain aerosol before inhalation and after exhalation. The bags are enclosed in boxes which are connected to a spirometer which records volumes. The entire system is automated so that the subject inhales a pre-set volume of aerosol and exhales a pre-set, larger volume of air from his lungs. Volumes are controlled by a rider on the spirometer wire which activates a group of solenoid driven valves. Quantities of aerosol in the bags are determined by integrating the photocurrent from an aerosol photometer when a bag is emptied through the photometer. The aerosol used has been a monodisperse mist of triphenylphosphate. (Author abstract modified)

11799 APTIC NO. 27289

Reichel, G. and W. T. Ulmer

PLACE OF RESEARCH, ITS ATMOSPHERIC POLLUTION, SELECTION AND DESCRIPTION OF COLLECTIVES METHODOLOGY OF INVESTIGATION. *(Der Untersuchungsort, seine atmosphaerische Belastung, die Kollektivauswahl und -beschreibung, Methodik der Untersuchung). Text in German. Arbeitsmedizin, 27(1-2):1-26, 1970. 68 refs.*

A total of 8162 men and women were examined from 1965 to 1968: 3670 from Duisburg, 2780 from Bocholt, and 1712 from the rural district of Borken. The population examined shows a different atmospheric and occupational burden which is discussed in detail. Taking into consideration further influencing factors such as age, weight, body size, and smoking habits, a comparison between the test populations permits an investigation of the importance of emissions occurring in towns on thefrequency of chronic non-specific airway diseases. An emphasis was placed on data which could be objectively evaluated, as qualitative characteristics are extremely dependent on the person examined and the investigator, and may lead to false conclusions.

11800 APTIC NO. 27291

Goldsmith, John R.

THE NEW AIRBORNE DISEASE. COMMUNITY AIR POLLUTION. *Calif. Med., 113(5):13-20, Nov. 1970. 16 refs.*

Photochemical air pollution of the California type involves newly defined atmospheric reactions, and it is due mostly to motor vehicle exhaust, associated with both affluence and careless waste. It is oxidizing, and produces ozone, plant damage, impairment of visibility, and eye and respiratory symptoms. Aggravation of asthma, impairment of lung function among persons with chronic respiratory disease and a possible causal role, along with cigarette smoking, in emphysema and chronic bronchitis are some of the effects of photochemical pollution. More subtle effects of pollution include impairment of oxygen transport by the blood due to carbon monoxide and interference with porphyrin metabolism due to lead. Carbon monoxide exposures may affect survival of patients who are in hospitals because of myocardial infarction. The physician has two responsibilities in the field of air pollution. One is to his patients, through providing adequate specific protection for sensitive individuals against the specific effects of air pollution when it is elevated. The second role of the physician is to help shape public policy regarding pollution by applying knowledge of the respiratory and other health hazards that come from polluted air whether from occupational exposure, cigarette smoking, or community air pollution. (Author abstract modified)

11801 APTIC NO. 27373

Watson, Donald E.

THE RISK OF CARCINOGENESIS FROM LONG-TERM LOW-DOSE EXPOSURE TO POLLUTION EMITTED BY FOSSIL-FUELED POWER PLANTS. *California Univ., Livermore, Lawrence Radiation Lab., 13p., Oct. 1, 1970. 36 refs.*

NTIS: UCRL-50937

A brief survey of the literature on the health effects of pollutants as studied in animal experiments is presented, with emphasis on potential carcinogenicity. The pollutants reviewed are ozone, nitrogen oxides, sulfur dioxide, and organic and inorganic particles. It is concluded that significant danger of carcinogenesis not adequately covered by current air quality standards exists from certain pollutants resulting from the combustion of fossil fuels, based on the relationship between cancer and cigarette smoking and the presence of compounds in polluted air similar or identical to carcinogenic and co-carcinogenic components of tobacco smoke. For example, the dose rate for the carcinogen benzo(a)pyrene from breathing urban air is of the order of that taken by a light smoker, a category for which lung cancer mortality ratios are given. The probability of cancer occurrence is enhanced by increasing the abundance of environmental carcinogens or, more importantly, co-carcinogens. Acceptable air quality standards for specific pollutants may be set only when enough is known about their modes of action and interaction; it is important at this stage to determine causality rather than to wait for further evidence of effect, considering that the latency period for lung cancer manifestation appears to be on the order of 20 yrs. Since anticipated cancer effects cannot be established by epidemiological studies in human populations, the urgency of research into cancer mechanisms, prevention, and treatment is stressed.

11802 APTIC NO. 27387

Mesman, Brick B. and Billy S. Smith

DETERMINATION OF MERCURY IN URINE BY ATOMIC ABSORPTION, UTILIZING THE APDC/MIBK EXTRACTION SYSTEM AND BOAT TECHNIQUE. *Atomic Absorption Newsletter, 9(4):81-83, July-Aug. 1970. 7 refs.*

A procedure is described for determining submicrogram quantities of mercury in urine. The method is based on the absorption of the 2537 A mercury resonance line. The urine specimens are extracted by an ammonium pyrrolidine dithiocarbamate/methyl isobutyl ketone (APDC/MIBK) system and the MIBK extract is evaporated on a tantalum boat. The mercury is detected by an atomic absorption spectrophotometer. A 50-ml urine sample is required, which allows for many replicate runs. Accuracy of the method is 96 plus or minus 6%. (Author abstract modified)

11803 APTIC NO. 27407

Horvath Steven M., Peter B. Raven, Barbara L. Drinkwater, James F. O'Hanlon, Jr., and Thomas E. Dahms

A BRIEF LITERATURE SEARCH REGARDING THE INFLUENCE OF AIR POLLUTANTS ON WORK CAPACITY AND PSYCHOPHYSIOLOGICAL RESPONSE OF MAN. *In: Project Clean Air. California Univ., Santa Barbara, Inst. of Environmental Stress, Vol. 2, App.-E, (E1-E25,) June 1970. 42 refs*

A literature search was made to obtain information on the effects of pollution on man's working capacity, on possible correlations between pollutants and disease, and on the psychophysiological effects of present urban concentrations of pollutants. There was found to be a complete lack of information on man's ability to work in a polluted environment. Based on epidemiological studies, the health effects of pollution cannot be studied independently of meteorological conditions. However, few studies have manipulated weather factors with the result that the interraction of ambient climatic conditions and pollutant levels on man's response have not been identified. While some factor or combination of factors in urban air appear to cause impairment of various psychophysiological functions, there has been no definitive study of this problem.

11804 APTIC NO. 27416

Tepper, L. B. and E. A. Pfitzer

CLINCIAL AND BIOCHEMICAL APPROACHES TO THE STUDY OF LEAD AT LOW LEVELS. REPORT OF A SYMPOSIUM FEBRUARY 1970. *Cincinnati Univ., Ohio, Kettering Lab., NAPCA Contract CPA-70-14 and PHS Grant ES00159, 28p., 1970.*

NTIS: PB 196767

A summary of conference reports is given on the state of current knowledge of each of the following major subject areas as related to lead: environmental and human concentrations; subcellular physiology; kidney effects; effects on the hematopoietic system; and neurological manifestations. The presentations illustrate the increasingly sophisticated methodology being used to study the symptoms of excessive lead absorption. Of even greater importance, however, would be the development of sensitive and specific measures capable of establishing whether or not 'normal' people are being harmed by current concentrations of lead in the 'normal' environment. No new, practical measures are as yet available as screening procedures to detect very early adverse responses to lead but numerous approaches are being investigated, including aminoaciduria, inclusion bodies, sodium pump inhibition, biochemica functions, enzyme changes, essential trace metals, heme synthesis, and nerve conduction time. (Author summary modified)

11805 APTIC NO. 27463

Forster, R. E.

CARBON MONOXIDE AND THE PARTIAL PRESSURE OF OXYGEN IN TISSUE. *Ann. N. Y. Acad. Sci., 174(1):233-241, Oct. 5, 1970. 29 refs.*

The influence of carbon monoxide and carboxyhemoglobin (HbCO) on tissue oxygen tension or pressure (PO2) is assessed. The major effect of HbCO in the blood is predicted to be a lowering of tissue venous PO2 produced by changes in the oxygen-hemoglobin equilibrium curve. Other sites of action cannot be ruled out, however. The precise functional effects of the expected decreases in tissue PO2 are difficult to predict bbecause of a lack of knowledge of tissue PO2 itself.

11806 APTIC NO. 27468

Lawther, P. J., R. E. Waller, and Maureeen Henderson

AIR POLLUTION AND EXACERBATIONS OF BRONCHITIS. *Thorax, 25(5): 525-539, 1970. 15 refs.*

A simple 'diary' technique was used in London and other large British cities to examine the relationships between daily changes in the condition of bronchitis patients and their environment. The results demonstrate that changes are closely related to air pollution, as indicated by sulfur dioxide concentrations. There is some evidence that the patients are more sensitive to the effects of pollution at the beginning than at the end of each winter. Comparative studies are now being made in London at five-yr intervals to study any change in response following the definite reduction in smoke concentrations. Preliminary results indicate some decline in the response of patients to specified SO2 concentrations, but in recent years there have been few days on which pollution was high enough to produce any response. The minimum pollution required for any significant response is about 500 microgram/cu m SO2 together with about 250 microgram/cu m smoke. (Author abstract modified)

11807 APTIC NO. 27481

Ayres, Stephen M., Stanley Giannelli, Jr., and Hiltrud Mueller

MYOCARDIAL AND SYSTEMIC RESPONSES TO CARBOXYHEMOGLOBIN. *Ann. N. Y. Acad. Sci., vol. 174:268-293, Oct. 5, 1970. 37 refs.*

Measurements of alveolar-capillary gas exchange, systemic hemodynamics, and myocardial metabolism were made in a series of human and canine studies before and after the administration of amounts of either 5% or 0.1% carbon monoxide, sufficient to raise carboxyhemoglobin saturation to between 5 and 25%. Arterial and mixed venous oxygen tensions were decreased by administration of either concentration, and changes could be identified with COHB saturations below 5%. Cardiac output and minute ventilation increased when COHB was elevated by breathing the higher concentration. The coronary arteriovenous oxygen difference was uniformly decreased and coronary blood flow increased when COHB was raised to between 5 and 10% saturation with either gas mixture in the human studies. Certain patients with coronary artery disease developed altered lactate and pyruvate metabolism following elevation of COHB suggesting myocardial hypoxia. Significant myocardial changes were seen in patients with elevation of COHB above 6% COHB. The canine preparation, in contrast, was notably more resistant to COHB, and significant alterations were not observed until COHB saturation exceeded 25%. (Author summary)

11808 APTIC NO. 27482

Chance, Britton, Maria Erecinska, and Michael Wagner

MITOCHONDRIAL RESPONSES TO CARBON MONOXIDE TOXICITY. *Ann. N. Y. Acad. Sci., vol. 174:193-204, Oct. 5, 1970. 14 refs.*

A study of the dynamic response of the carbon monoxide-inhibited respiratory component of isolated mitochondria gives several important hints for those who are interested in the total picture of carbon monoxide toxicity. First, compensatory mechanisms whereby the respiratory chain is able to diminish its inherently high vulnerability to carbon monoxide are identified as branching and cushioning phenomena. Essentially, they can be defined as an ability of the matrix of enzymes involved in membrane-bound electron flow to be activated effectively to establish redox patterns of optimal effectiveness by remaining uninhibited cytochrome molecules, thus enabling the flow of oxidizing equivalents to spread through the totality of the membrane components. Time factors associated with this response are related not only to the kinetics of the process itself, but also to the function of the large pool of reducing substances in the mitochondrial electron transfer system. The times required for these pools to be activated by CO-inhibited cytochrome depend critically upon the metabolic state which, in turn, controls the reactivity of these pools in electron flow. The extreme sensitivity of mitochondria in the uncoupled or metabolically active state to small concentrations of CO in transient changes from anoxia to normoxia is emphasized and pointed to as a further complexity in considering the totality of tissue CO toxicity. (Author summary)

11809 APTIC NO. 27490

Ohmori, Kaoru, Haruko Saito, Akemi Tanizaki, Katsunori Omura, Masamichi Ichihara, and Kazuo Uryu

EXPERIMENTAL STUDIES ON INHALATION OF LEADED GASOLINE VAPOR. *(Kaen gasorin kyunyu no eikyo ni kansuru jikkenteki kento). Text in Japanese. Yokohama Igaku (Yokohama Medical J.), 21(3): 387-391, Sept. 1970. 10 refs.*

To determine the effect of alkyl lead compounds upon an organism, six male white rabbits were exposed to the vapors of commercial leaded gasoline (mineral lead; 0.56 g/l 0.83 g/l) at a concentration of 500 ppm with continual exposure of 3 hours/day, and five days/week for 92-220 days. Every 15-20 days, blood and urine samples were obtained. The lead concentrations in blood and urine were measured by performing dithizone colorimetric analysis by means of the moist calcination method. The coproporphyrine concentrations in urine were measured by the Rimington Sano method. Moreover, general dispositions of the blood were observed, by concentrating upon anemia and then, the concentrations of lead in the various tissues were observed by practicing dissection. The lead concentrations in blood increased gradually from 10 microgram/dl to the highest level of 70 microgram/dl with continuous exposure. The lead concentrations in urine increased slightly in general, but the amounts were, as a whole, in normal range, taking into account the peculiarity of the excretion process of alkyl lead, differences of excretion faculty according to the individual samples and the ranges of the amount of excretion in each individual sample. The excretion of coproporphyrine in urine was also normal. The lead concentrations in liver were 386.0 microgram/100 1170.6 microgram/100, and in kidney; 266.3 microgram/100 676.0 microgram/100 but remarkable accumulations were not recognized in the other tissues. From the above study, such positive symptoms as to support poisoning by the inhalation of alkyl lead were not established, but the symptoms of accumulations of lead in organism were apparently recognized.

11810 APTIC NO. 27537

Iwai, Kazuro, Hiroshi Hatsushikano, Tatsuro Iwasaki, Hiroshi Yanagawa, and Itsuzo Shigematsu

THE RELATIONSHIP BETWEEN AIR POLLUTION AND CHANGES OF THE LUNGS, SEEN IN THE AUTOPSIED LUNGS, AND THE RESULTS OF CHEST ROENTGENOGRAPHIC EXAMINATION. *(Taikiosen to hai henka ni tsuite. Boken hai shoken to kyobu x-sen shoken kara). Text in Japanese. Nippon Kyobu Rinsho (Japan. J. Chest Diseases), 29(12):871-878, Dec. 1970. 12 refs.*

The number of the black-dust deposit spots seen in the autopsied lungs is influenced by the degree of environmental air pollution and smoking habits. The amount of black-dust is parallel with the prevalence rates of chronic bronchitis and pulmonary emphysematous lesions. Chest roentgenograms of the inhabitants over 30 years old (except patients showing prominent evidence of tuberculosis) of 13 highly-polluted and 13 non-polluted districts, chosen from research on the actual states of tuberculosis, were read with certain criteria in 1968 with the objective of finding the effects of air pollution and smoking on the respiratory organs by observing small changes in the vascular shadows. The total number of cases with cough, sputum, and asthma were obtained from the result of interviews. Inquiries about living history, smoking habit, smoking period, the age of first starting smoking, and the kind of cigarettes smoked were carried out on all inhabitants by questionnaire. The prevalence rates of subjective symptoms, emphysematous changes, and nodal shadows of x-ray were higher in polluted districts than in non-polluted districts among each age-group of men. With respect to the relationship between x-ray findings and subjective symptoms, the prevalence rate of sputum in general was higher in the group of nodal shadows than in the normal group. The prevalence rate of sputum in men was higher in polluted districts, regardless of the amount of smoking. This trend became clearer, limiting subjects to persons who have lived for over 10 years in polluted districts. The prevalence rate was higher among heavy smokers. No difference between the prevalence rates in polluted and non-polluted districts was observed in any of the cases among women.

11811 APTIC NO. 27539

Reichel, G., W. T. Ulmer, K. Gary, A. Leuschner, and G. Roeske

INFLUENCE OF THE LOCALLY DIFFERENT GRADE OF POLLUTION IN THE TOWNSHIP OF DUISBURG ON THE INCIDENCE OF NON SPECIFIC RESPIRATORY DISEASES. *(Einfluss des oertlich unterschiedlichen Verschmutzungsgrades im Stadtgebiet von Duisburg auf die Haeufigkeit unspezifischer Atemwegserkrankungen). Text in German. Arbeitsmedizin, 17(1-2):110-129, 1970. 38 refs.*

From 1965 to 1966, 1292 men and 843 women living for more than 10 years in the town district of Duisburg were examined. According to the amount of total dust and of sulfate precipitate, the residentia districts were divided into three different zones of dust nuisance. Comparison of the partial groups, being similar in their sociologic structures, their smoking habits, and their age compositions, did not show any prevalence of cough, expectoration and dyspnea in regard to the SO4 or total dust precipitate. The same was true of the auscultation findings and diverse lung function parameters like intrabronchial flow resistance, arterial blood gases, and arterio alveolar carbon dioxide pressure difference. Division of the urban pollution zones according to their sulfur dioxide and dust precipitate remains nevertheless a problem, because the concentration of other noxious substances does not go hand in hand with the amount of dust precipitate and SO2 emission as can be shown, for example, in case of the fluorine content of leaves. Information, in how far industrial air pollution altogether has a noxious effect on the bronchial system, is, however, to be gained from the comparison between a rural population not exposed to industrial waste gases and the town population of the Ruhr-district This comparison did not show any differences between town and country population which indicate an orientated influence of unspecified airway diseases by air pollution in the Ruhr-district. (Author summary)

11812 APTIC NO. 27558

Estabrook, Ronald W., Michael R. Franklin, and Alfred C. Hildebrandt

FACTORS INFLUENCING THE INHIBITORY EFFECT OF CARBON MONOXIDE ON CYTOCHROME P-450-CATALYZED MIXED FUNCTION OXIDATION REACTIONS. *Ann. N. Y. Acad. Sci., vol. 174:218-232, Oct. 5, 1970. 29 refs.*

Experiments are reported which have attempted to determine some of the complexities associated with the effectiveness of carbon monoxide in modifying the microsomal oxidation reactions involved in the detoxification of a variety of substrates. Under appropriate conditions the cytochrome P-450 catalyzed reactions are significantly more inhibited by CO than the mitochondrial oxidation reactions catalyzed by cytochrome oxidase. It is ironic that the oxidative degradation of the heme of hemoglobin by a cytochrome P-450 catalyzed reaction results in the formation of CO, an inhibitor of the reaction. Possible mechanisms of cytochrome P-450 function during oxidative reactions are discussed. It is well established that the substrate to be hydroxylated reacts first with the ferric form of cytochrome P-450. Further, it appears reasonable to assume that cytochrome P-450 undergoes oxidation-reduction changes during the time course of mixed function oxidation reactions. Unresolved are the steps involved in the transfer of two electron equivalents required for the activation of oxygen associated with such hydroxylation reactions. Since CO is a competitive inhibitor with oxygen for the overall reaction, it is assumed that these two compounds interact at the same site (i.e., the heme iron). CO, however, results in the formation of a photodissociable complex of reduced cytochrome P-450 with unique absorbance characteristics. The present results indicate that the presence of substrate does not modify the degree of CO sensitivity of the reaction, implying that this step may not impose a rate with CO. Experiments illustrating a marked changed in the CO sensitivity of the overall reaction by modifying the rate of electron or reducing equivalent transfer to ferric cytochrome P-450 does suggest, however, that the steady-state concentration of ferrous cytochrome P-450 is the critical determinant in establishing the degree of CO inhibition. Interestingly, the inhibition by metyrapone appears to result from an interaction at a site common with CO or oxygen, thereby forming an inactive complex that is not readily dissociable. (Author abstract)

11813 APTIC NO. 27633

Sawicki, Feliks, Jan Steczkowski, Jan Kopczynski, Teresa Dobrowolska, Barbara Olszowy, Zofia Szromba-Rysowa, Danuta Tylkowa, Anna Zambrzycka-Kunachowicz, Eugeniusz Nikodemowicz, Stanislaw Janczy, Liliana Pawlikowska, Wladyslawa Maternowska, Maria Krakowska, Leokadia Czajkowa, Jan Ostrowski, and Wieslaw Jedrychowski

CHRONIC NONSPECIFIC RESPIRATORY DISEASES IN THE CITY OF CRACOW. XI. THE CROSS SECTION STUDY. *Epidemiol. Rev., 23(3-4):242-252, 1969.*

The mechanics of planning and executing a health survey of the population of Cracow, Poland, are described as part of a study of factors affecting chronic respiratory disease in that city. Preparation for the sample lasted almost three years, with two preliminary pilot studies. Interviews were conducted with a random sample of the population and with selected groups of workers from two industrial plants; clinical measurements of the interviewed persons included body height and weight and pulmonary ventilatory capacity. Chest radiography was also carried out. The sampling method, training of the interviewers and other staff, interview procedure, and record keeping are described. A total of 1779 dwellings out of 1930 selected were finally visited, inhabited by 4653 persons in the age groups under study (18-69 yrs). Clinical studies were performed on 3063 persons. In the two occupational samples 683 persons were interviewed. Data processing is being conducted using computer techniques.

11814 APTIC NO. 27645

Inokawa, Takao and Michiko Taga

RELATIONS BETWEEN METEOROLOGICAL CONDITION AND DEATHH. REPORT 14. *(Kisho joken to shibo tono kankei. (Dai 14 ho)). Text in Japanese. Nippon Ika Daigaku Zasshi (J. Nippon Med. School), 37(5):368-375, Oct. 1970. 58 refs.*

The persons who had lived in the wards of Tokyo and died during one year from January 1st to December 31st, 1962 were classified by sex, age, day of death, and cause of death; the relation between these factors and the condition of smoke and fog ('smog') was discussed. Mortality per million persons was calculated; the mortality divided by the number of days under the same climatic condition was provisionally designated as mortality index of each condition of weather. The incidence of smog days was 27 times in a year. The mortality index of smog days was 20% higher than the yearly average (1.3) and 21% higher than that of non-smog days without distinction of sex factor. The mortality index by age groups on smog days showed 21% higher than that of non-smog days in all the age groups, except 10 to 14 years and 35 to 39 years of age. For mortality index by cause of death, the same tendency was observed. In the groups of persons who died from bronchial asthma, bronchitis, pneumonia, pulmonary tuberculosis, stomach ulcer, gastroenteritis, cardiac diseases, hypertension, rheumatoid fever, nephrosis and homicide, mortality index of smog days was significantly higher than the yearly average. There was no positive association between temperature, humidity, diurnal difference of temperature, and death on smog days. When the weather continued to be smoggy, the mortality during those days was higher than that before and after them.

11815 APTIC NO. 27647

Matsumoto, Hiroshi

VARIATION OF PEAK FLOW RATE IN HEALTHY SCHOOL CHILDREN. (REPORT 1.) DIURNAL VARIATION. *(Shoni no saidai kokiryuryo no hendo ni kansuru kenkyu. Dai. 1 ho. Saidai kokiryuryochi no nichi henka). Text in Japanese. Nippon Koshu Eisei Zasshi (Japan J. Public Health), 17(9):449-55, Sept. 1970. 40 refs.*

Diurnal variations of children's peak flow rate were measured using Wright's peakflow meter. Eleven boys and girls between 8-12 years old without any respiratory disease were studied and measurements were carried out five times during 7 days between 9:30 am and 7 pm within the period of March 13 through March 22. Among the three measurements, the highest estimation was recorded; as a relative variation, 7 days' average estimation of the individual child was calculated and its percentage to each estimation recorded was computed. The diurnal variation of peak flow rate (PF) was as follows: S.D. equals 9.1 22.2 l/min; the variation within 7 days period, S.D. equals 14.0 32.6 l/min, showing that diurnal variation was smaller than the variation in a longer period. The result of dispersion analysis on the time of measurement, the day of measurement, and the differences among the individuals, which are considered to be the factors that affect the variations of the estimation showed significant differences in the following: the differences among individuals (rate of dispersion 773.4), the day of measurement (rate of dispersion 10.57), differences among the individuals by day (rate of dispersion 3.95), and day all by (rate of dispersion 2.68). In this study, a clear diurnal variation was not found in PF, but the lowering of the respiratory function may have been due to the atmospheric changes.

11816 APTIC NO. 27666

Forbes, W. H.

CARBON MONOXIDE UPTAKE VIA THE LUNGS. *Ann. N. Y. Acad. Sci., vol. 174:72-75, Oct. 5, 1970. 6 refs.*

The balance between the taking up and the giving off of carbon monoxide in the lungs is reviewed. Details of the movement of atmospheric CO on its way to combine with the hemoglobin in the blood are summarized, and reasons are suggested for the rather large difference between individuals. Elimination of CO and resuscitation are briefly mentioned. The streets of our large cities vary greatly in the amount of CO they contain, but, not infrequently, may reach peaks of 100 ppm, which is 20 to 30 times the value with which the blood of an unexposed individual would be in equilibrium. It is useful to consider three stages that CO must pass through in order to combine with the hemoglobin: first, it must get into the alveoli of the lungs, then pass through the alveolar membranes into the blood, and finally, enter the red cell to combine with the hemoglobin. Although the rate of association of CO with hemoglobin in the red blood cell is only about 20% slower than the rate of association of oxygen with hemoglobin, the rate of dissociation of carboxyhemoglobin is a very small fraction of the rate of dissociation of oxyhemoglobin. With resuscitation, the important thing is to get oxygen to the tissues, and the speed at which CO is eliminated is secondary.

11817 APTIC NO. 27693

Nagoya Municipal Office (Japan)

REPORT ON THE EFFECT OF AIR POLLUTION ON CHILDREN OF NAGOYA CITY. *(Taiki osen ga Nagoya shimin (gakudo) no kenko ni oyobosu eikyoni chosa hokoku). Text in Japanese. 85p., Oct. 1970.*

In 1968, a survey was conducted to determine the effect of air pollution on children, in Nagoya City. Three schools from areas of heavy air pollution and two control schools were chosen. The recovery of questionnaires exceeded 90%, and indicated the children in the heavily polluted area to be very much aware of the effects of air pollution. They attributed the pollution to factories. They were conscious of metals getting rusty quickly, poor growth of plants, clothes and window panes getting dirty, bad odor, headache, coughing, smarting eyes, sore throat, frequent colds, phlegm, nausea, and poor appetite. More respiratory diseases were noted in the past, as well as conjunctivitis. However, as far as breathing capacity of the lungs was concerned, there was no appreciable difference between the children in the polluted area and control groups. Absenteeism was more frequent in control groups. This may be attributed to the fact that parents in those areas were more solicitous about their children. While it is difficult to test the lung capacity of children, perhaps the test method can be improved in the future.

11818 APTIC NO. 27784

Roussel, Andre

ATMOSPHERIC POLLUTION AND HEALTH. *(La pollution atmospheric et la sante). Text in French. Ann. Mines (Paris), no. 11:7-14, Nov. 1970.*

While the incidence of infectious microbial diseases is decreasing and while in a few years the same can be expected of virus diseases the pathological effects of atmospheric pollution are on the increase. The pollutants are dusts, gases, and aerosols. From a medical point of view, aside from the allergic effects of dusts the worst pollutants are gases and aerosols which penetrate into the bronchi. Below a diameter of 5 micron, particles freely penetrate pulmonary alveoli and the aggression there is direct. Atmospheric pollution at the usual levels does not have germ killin power. The effects of pollution on health can be studied experimentally in the laboratory and by epidemiological research. To study morbidity, detailed statistics are needed. Accidents caused by air pollution have all involved the bronchopulmonary and the cardiovascular system, they have been characterized by the absence of specific lesions in the organs examined, they have most affected children, old and weak individuals and individuals already afflicted with bronchial, pulmonary or cardiac impairments and the pollutants causing the accidents have been present in the atmosphere at below toxic levels. The main disorders caused by air pollution include chronic bronchitis, asthma, fatigue, eye irritation, broncho-pulmonary cancer and the bronchopulmonary infections. The long-term effects of air pollution are unpredictable and they may exceed the adaptive faculty of man because the environmental changes are too rapid.

11819 APTIC NO. 28256

Cooper, Peter

POISONS AND THE FOETUS. *Pharm. J., 204(5547):173-175, Feb. 21, 1970. 25 refs.*

Examples are cited to show the correlation between lead in illicit moonshine and foetal abnormalties, the correlation between the cadmium content of cigarettes and chronic bronchitis and/or emphysema, and the close resemblance between signs and symptoms of chronic manganese poisoning and those of Parkinson's disease. In addition, the misuse of medicaments is discussed with reference to lithium carbonate, atropine, solanaceous alkaloids, and cough preparations. Also noted is the marked carcinogenic potential of benzidine and o-tolidine both used in testing for occult blood. Experiments with activated charcoal as an antidote to acute poisoning are reported.

11820 APTIC NO. 28714

Toyama, Toshio and Shiro Adachi

DAILY DEATH AND URBAN ENVIRONMENT (IN TOKYO). *(Kankyo to toshi no shibogensho (Tokyo-to ni okeru). Text in Japanese. Nippon Eiseigaku Zasshi (Japan J. Hyg.), 26(1):158, April 1971. (Presented at the Japanese Society for Hygiene, Annual Meeting, 41st, Tokyo, Japan, April 3-4, 1971.)*

Daily death figures from April 1966 to March 1969 were obtained from 23 wards of Tokyo. Delta death-15dma (the difference between the daily deaths and the 15 days moving average (15 dma), used to eliminate seasonal variables was calculated. Then the correlation coefficient of delta death-15dma vs temperature and the degree of air pollution (sulfur dioxide concentration and floating dust) was investigated. Analysis of the data revealed that the correlation between daily deaths and the degree of air pollution was not high in general; no marked monthly tendency was present in the correlation between 15 dma and the degree of air pollution. On the other hand, a significant correlation was observed between daily deaths and temperature; the highest correlation was observed in August between 15dma and temperature. There was no significant differnce between the correlation of delta death -15dma vs temperature and the degree of air pollution for the same day, for one day, two day, and three day lag.

11821 APTIC NO. 28721

Shimizu, Hiroaki, Tadashi Yasuda, Yasunori Goto, Tsuneyasu Abe, Yutaka Yoshida, Katsumi Murakami, Shoji Norimatsu, and Soten Komatsu

A STUDY ON RICKETS IN TOKYO DISTRICT. (REPORT 1). *Tokyo chiku ni okeru kurubyo no chosa ni tsuite. (Dai 1ho)). Text in Japanese. Shoni Hoken Kenkyu (J. Child Health), 29(2):106, Jan. 1971. (Presented at the Japanese Society of Child Health, Annual Meeting, 17th, Kurume, Japan, Oct. 16-17, 1970.)*

Infants within the jurisdiction of Arakawa Health Center (air-polluted area) and Shakujii Health Center (nonpolluted area) were examined in summer and winter for occurrence ratios of the rickets-like transformations on carpal bones. X-rays were taken of 600 three to four and a half-month-old infants in Arakawa and 251 in Shakujii (almost equal number of males and females). The grades of the rickets-like transformations indicated by X-rays were classified as (-), (+-), (+), and (++). The occurrence ratios of the rickets-like transformations were about the same in the two seasons: Shakujii, (+ -), 10 - 12%, (+) - (++) 3.3 6.3%, Arakawa -(+,-) 16-17%, (+) - (++) 5-7.2%. The ratio was higher in the infants who weighed 3500 g or more at birth compared with those born prematurely. The ratios in terms of alimentation were highest in the artificial feeding group (26%), and lowest in the suckling infants (13%). Fifty percent of the infants who were classified as (+) -(++) were not given sunbaths. Levels of alkaline phosphatase in blood serum were higher in the group (+) -(++), exceeding the upper limit (unit 35 King Armstrong) in 46% of the group. Bone age estimation points of the carpal bones were as follows: in the group examined in summer, bones were more mature than the bone age in the positive groups, and the formations of the skeleton occurred earlier; the opposite results were recognized in the group examined in winter.

11822 APTIC NO. 28761

Momotani,Hiroshi, Toshio Toyama, and Shiro Adachi

CO LEVEL IN EXPIRED AIR IN VARIOUS COMMUNITIES. *(Irio na shudan ni okeru koki CO nodo). Text in Japanese. Taiki Osen Kenkyu (J. Japan Soc. Air Pollution), 5(1):138, 1970. (Proceedings of the Japan Society of Air Pollution, Annual Meeting, 11th, 1970.)*

The degree of carbon monoxide intrusion into the body was measured by estimating the amount of carboxyhemoglobin in the blood and recording the concentration of CO in expired air. Expired air was collected by the method of stopping breathing for 20 sec and was analyzed by an infrared analyzer. The subjects were pupils of junior high schools in Tokyo and in an agricultural village, rural adults, and individuals whose work entailed driving automobiles. The subjects were also divided according to smokers and nonsmokers. The results are listed in detail.

11823 APTIC NO. 28814

Biersteker, K.

AIR POLLUTION AND MORTALITY IN ROTTERDAM. *(De medische betekenis van de luchtverontreiniging in Rotterdam). Text in Dutch. Jaarboek Kankeronderzoek Kankerbestrijding Nederland, no. 15:183- 195, 1965. 6 refs.*

Air pollution in general and in particular the presence of carcinogenic compounds are a public health problem. Although there was not an increase in total daily mortality during the past seven years on days of severe air pollution in Rotterdam, there was a positive fluctuation in the number of deaths from cardiorespiratory dizeases and tumors in December 1962 and January 1959. However, the presence of more sulfur dioxide indoors than outdoors in some Rotterdam homes makes one uncertain as to whether this correlation is causal to indoor or outdoor concentrations. Death rates from chronic bronchitis in Rotterdam were compared to those for 4 agricultural communities. While the chronic bronchitis mortality was stationary in the 4 provinces, Rotterdam males showed a 100% increase in death rate since 1950. An analysis of occupations revealed a possible promoting influence of the following occupations on lung cancer risk: metalworker, painter, and driver. However, occupation alone explains only a very small part of the total male lung cancer mortality in Rotterdam. Smoking habits also have not explained a higher lung cancer mortality nor has air pollution definitely been concluded to account for this prevalence of lung cancer. (Author summary modified)

11824 APTIC NO. 28825

Selikoff, Irving J. and E. Cuyler Hammond

COMMUNITY EFFECTS OF NONOCCUPATIONAL ENVIRONMENTAL ASBESTOS EXPOSURE. *Am. J. Public Health, 58(9):1658-1666, Sept. 1968. 50 refs. (Presented at the American Health Association, 95th Annual Meeting, Miami Beach, Fla., Oct. 25, 1967.)*

An overview indicates that at least one pneumoconiotic dust, asbestos, may be widely disseminated into the general community from industry sources or end-product use; that such dissemination may produce detectable disease; and that methods to study the question can be designed. Scattered instances of calcification of the pleura, particularly the parietal pleura, were observed in asbestos workers during the 1930s and 1940s, but their significance as a roentgenologic sign of asbestos exposure was not appreciated until a 1955 report in which such calcification was described in approximately 5% of 343 Dresdon asbestos workers. Pleural fibrosis is another common pleural complication of asbestos exposure, and neoplasms of the pleural surface (mesotheliomas) in association with asbestosis have been known for over 30 years. Recent epidemiological investigations are mentioned, and several questions which require study and explanation are posed.

11825 APTIC NO. 28834

Schroeder, Henry A.

SOME PROSPECTS FOR RESEARCH ON BIOLOGICALLY ACTIVE TRACE ELEMENTS. *Missouri Univ., Columbia, Conf. Trace Substances Environ. Health, 1st, Columbia, Mo., 1967, p. 20-28. 30 refs. (July 10-11.)*

Only nine trace elements are recognized as essential to mammalian life or health, all probably important catalysts for differing biological functions, many of them unknown. These are chromium, manganese, iron, cobalt, copper, zinc, selenium, molybdenum, and iodine. Others which are suspected to have a biological function include vanadium, nickel, arsenate, and fluorine. Because of modern agricultural practices resulting from the increasing demand for food, and modern methods for the refining of food, human intakes of essential trace elements may become marginal or deficien in those necessary for man but less so for plants. Two specific examples of this are mentioned, and reference is made to chromium deficiency. An intake adequate for life is not necessarily one adequate for optimal health and function. Accumulation of essential elements, as caused by a wide variety of hereditary disorders and environmental exposures, is also discussed. Lead is mentioned as a consequence of automobile exhaust, while cadmium may promote hypertension.

11826 APTIC NO. 28846

Sayers, R. R.

TOXICOLOGY OF GASES AND VAPORS. *In: International Critical Tables of Numerical Data, Physics, Chemistry and Technology. Edward W. Washburn (ed.), vol. 2, New York, McGraw-Hill, 1927, p. 318-321. 14 refs.*

Toxicological factors are presented for acrolein, ammonia, aniline, arsine, benzene, bromine, carbon disulfide, carbon dioxide, carbon monoxide, carbon tetrachloride, chlorine, chloroform, chloropicrin, dichlorodiethyl sulfide, hydrogen chloride, hydrogen cyanide, hydrogen sulfide, iodine, mercury, nitrogen oxides, nitrobenzene, phosgene, phosphorus trichloride, phosphine, sulfur dioxide, sulfur trioxide, and toluidine. These factors include boiling point, concentration percentage fatal in 30 min or less, percentage causing dangerous illness in 0.5 to 1 hour, percentage that can be borne without severe effects for 0.5 to 1 hour, maximum safe concentration, physical properties, portal of entry, symptoms, and occupations. An outline is also given for the prevention and emergency treatment of gas poisoning.

11827 APTIC NO. 28847

Smirnov, D. D.

X-RAY DETECTION OF LEAD-CARRIER STATE AMONG CHILDREN LIVING IN THE VICINITY OF A LEAD PROCESSING PLANT. *(Vyyavleniye s pomoshch'yu rentgenografii nositel 'stva svintsa u detey, prozhivayushchikh v okrestnostyakh zavoda, pererabatyvayushchego svinets). Text in Russian. Gigiena i Sanit., 27(10):8-11, Oct. 1962. 10 refs.*

X-ray examination of 511 children attending kindergartens and nurseries in the vicinity of a lead processing plant revealed infiltration bands due to lead at zones of preliminary calcificatio in thigh, shin, forearm, and hand bones in 64 cases. Significant levels of urinary lead were found in 21 cases, trace amounts in 6. Analysis of 60 soil samples showed 0.056-0.81% lead, while 15 cabbages grown in this soil contained lead in amounts of 0.152-0.4% ash content.

11828 APTIC NO. 28859

Kotin, Paul

CARCINOGENESIS OF THE LUNG: ENVIROHMENTAL AND HOST FACTORS. *In: The Lung. Averill A. Liebow and David E. Smith (eds.), Baltimore, Williams and Wilkins, 1968, Chapt. 14, p. 203-225. 40 refs.*

In considering carcinogenesis in the lung, it is necessary to synthesize epidemiologic, clinical, and experimental factors. Epidemiologically, the following observations must be kept in sight: the relatively low attack rate, the long induction period, disappearance of the responsible agent or agents from the neoplastic site at the time of tumor appearance, and the frequently long interval between cessation of exposure and tumor appearance. The complex environment to which man is exposed is consistent with laboratory observations that multiple factors may aact in combinati to induce lung cancer. Delineation of environmental factors responsible for the increase has focused on three major areas of apparent etiologic significance: cigarette smoking, urban residence, and occupational environment. Dynamics of the passage of particulates through the arborizations of the tracheobronchial tree and the pattern of deposition and retention underlie several observations fundamental to an understanding of their mechanism of action. The ciliary mucous apparatus and epithelial response are discussed, as well as pathologic aspects of pulmonary carcinogenesis. For lung cancer, as with all neoplasms, as yet un-defined systemic factors appear operative in determining such parameters as susceptibility to the action of carcinogenic agents and the natural history of overt neoplasms. Migratory populations, factors affecting sexual differences, and metabolic factors modifying the response to carcinogenic polyclyclic aromatic hydrocarbons are discussed. Growing experimental data suggesting a role for viral agents in the pathogenesis of experimental neoplasti disease direct us to studies utilizing both oncogenic and nononcogenic viruses alone and in combination with chemical carcinogens. (Author conclusions modified)

11829 APTIC NO. 28868

Charleroy, Durant K.

NITROUS AND NITRIC GAS CASUALTIES. *Nav. Med. Bull., 44(2):435-437, Feb. 1945.*

A report is presented of 23 cases of gas poisoning caused by nitrou and nitric gases, resulting from a fire which was adjacent to a supply of blasting gelatine used for boosters in hand depth charges Of the 23 men affected by the fumes, 9 were seriously affected, with 2 deaths. Effects were not noted immediately after the exposure, but developed 4 to 24 hours later. All patients had the same prodromal symptoms of headache, a sensation of fullness in the head, a sense of tightness in the chest, and a slight cough. The 9 most seriously affected complained of these symptoms for a few hour and then in a very short time became dyspneic, nauseated, and cyanotic in varying degrees. They complained of extreme weakness, and of pain just under the sternum which was aggravated by exertion or by deep respiration. Treatment aboard ship consisted of oxygen as necessary for cyanosis, codeine, bed rest, and routine measures. All the patients who reached the hospital approximately 48 hours after exposure to the gas showed a bronchopneumonia, mild hemoconcentration, increased sedimentation rate, and leukocytosis. Penicillin was given in massive doses.

11830 APTIC NO. 28876

Martin, A. E. and W. H. Bradley

MORTALITY, FOG AND ATMOSPHERIC POLLUTION. AN INVESTIGATION DURING THE WINTER OF 1958-59. *Monthly Bulletin of the Ministry of Health and the Public Health Laboratory Service, vol. 9:56-73, 1960.*

The effect of fog incidents on the daily number of deaths in Greate London was investigated during the winter of 1958-1959. The investigation was confined to changes in mortality found within either 24 or 48 hours of a deterioration in atmospheric conditions. There were a considerable number of minor fog incidents where small increases in atmospheric pollution were found to be accompanied by small increases in the daily numbers of deaths. The effect on mortality was an immediate one and the deaths usually fell on the following day. Correlation tests showed a significant positive association between black suspended matter in the atmosphere and th daily number of deaths, a slightly less but still significant association between atmospheric SO2 and deaths and a significant negative association between visibility and deaths. Bronchitis deaths did not show as high a correlation with atmospheric conditions as the total daily deaths. The probable effect of atmospheric conditions on persons suffering from cardiovascular disease is discussed. In view of the importance of the close association shown to exist between comparatively minor changes in atmospheric conditions and mortality during the winter of 1958-59, it was considered advisable to repeat the investigation in subsequent winters. (Author summary modified)

11831 APTIC NO. 28896

Mnatsakanyan, A. V. and A. V. Mushegyan

EFFECT OF LOW CONCENTRATIONS OF CHLOROPRENE ON PORPHYRIN METABOLISM IN CHILDREN. *(O vliyanii malykh kontsentratsiy khloroprena na pofirinovyy obmen u detiy). Text in Russian. Gigiena i Sanit., vol. 29:83-84, Dec. 1964. 3 refs.*

Children, ages 5-8 years, attending nursery schools in the vicinity of a chloroprene rubber plant, were examined. These children were exposed to average daily concentrations of atmospheric chloroprene of 0.13 to 0.48 mg/cu m, depending upon the distance from the plant and time of year. Quantities of urinary coproporphyrin collected over a 5-6 hr period varied from an average of 4.11 micrograms in 105 controls located 7100 m from the plant, to 6.36 micrograms in 42 children located at 100 m, while a third group of 99 children attending nursery 500 m from the plant showed an average content of 5.51 micrograms.

11832 APTIC NO. 28906

Yanysheva, N. Ya., L. G. Andriyenko, N. V. Valenko, and I. S. Kireyeva

CANCEROGENIC PROPERTIES OF COKE OVEN DISCHARGES. *(O 0kantserogennykh svoystvakh vybrosov koksovykh pechey). Text in Russian. Gigiena i Sanit., vol. 29:7-10, May 1964. 6 refs.*

The carcinogenic action of the resinous components from coke-oven gas (containing 0.3% benzo(a)pyrene) was studied in 150 rats (10 controls). Three daily skin applications were administered a total of 67 times over a 7-month period. By month 4 (41 applications) 72 of the treated animals had developed papillomas, and by the end of the experiment 88 animals were affected. Spectrophotometric studies revealed the presence of five additional polycyclic aromatic hydrocarbons in these resins (anthracene, 1,2-benzanthracene, phenanthrene, pyrene, and chrysene), all of which are potential carcinogenic or cocarcinogeni agents.

11833 APTIC NO. 28911

Herzog, H.

CHRONIC OBSTRUCTIVE LUNG DISEASES. *(Chronisch-obstruktive Lungenerkrankungen). Text in German. Fortschr. Med., 87(35/36):1428-1436, Dec. 18, 1969.*

Every sixth non-smoker and every second smoker suffers from bronchitis. Of these, the ratio of men to women is 5 to 1, the age of greatest incidence is 60 for men, 70 for women. The principal causes are smoking, air pollution, alcohol, and viral diseases. The pathophysiological consequence of hypersecretion, of dyscrinism, and of damage to the ciliary epithelium is impaired pulmonary self-purification. Respiration is affected as a result of bronchial and of parenchymatous changes leading to changes in the respiratory mechanism, in gas exchange, and in hemodynamics of the pulmonary circulation. As a result of hypoxemia or of hypercapnia general circulation is affected inducing corpulmonale. In advanced chronic bronchitis, a collapse of bronchi and of bronchioli is often observed. Differential diagnosis of chronic non-specific lung diseases is an indispensable condition for the initiation of effective therapy.

11834 APTIC NO. 28924

Angel, Charles R.

CURRENT CAPABILITIES IN ANALYSIS OF TRACE SUBSTANCES: BIOCHEMICAL METHODS. *Missouri University, Columbia, Conf. Trace Substances Environ. Health. 1st, Columbia, Mo., 1967. p. 51-55. (July 10- 11.)*

Measurement of trace substances has been markedly enhanced with the development and perfection of atomic absorption spectrometry and neutron activation analysis. In the design of an integrated study of the relation of trace substances to other biochemical variables, several factors must be considered if experimental goals are to be achieved: single versus multiple measurements, multiple variables, time sequence, bound versus free, and the type of material to be measured. Types of methodology that might be employed are also mentioned. Since environmental studies involve large numbers and types of samples, consideration of automation as a functional means of completing timely studies is obligatory. Utilization of wet analytical chemistry is discussed and suggestions are made for utilizing such a system. This sytem was constructed to measure carbohydrate and nitrogen metabolism in erythrocytes parasitized with Plasmodium berghei, and it is also being used for screening potential antimalarial drugs. Determination of copper and manganese in biological specimens is mentioned.

11835 APTIC NO. 28926

Environmental Protection Agency, Washington, D. C., Air Pollution Control Office

AIR QUALITY CRITERIA FOR NITROGEN OXIDES. *Pub. No. AP-84, 175p., Jan. 1971. 222 refs.*
NTIS: PB 197 333

Chemical and physical characteristics of the nitrogen oxides are reviewed, and the relative merit of various analytical methods for their measurement is considered. The effects of nitrogen oxides on visibility, vegetation, and materials are discussed, as well as their toxicological effects on animals and on man. Epidemiological studies are indicated that assess the general population dose response and the specific response of children to nitrogen oxides. Sources and the control of atmospheric nitrogen oxides are discussed, including their chemical interaction in the atmosphere. Diurnal, seasonal, and annual trends are mentioned, and the effect of meteorological factors is considered. The literature has been reviewed thoroughly for information related to the development of air quality criteria for nitrogen oxides, and the document not only summarizes the current scientific knowledge of nitrogen oxides air pollution, but also points up the major deficiencies in that knowledge and the needs for further research.

11836 APTIC NO. 28938

Mathews, Kenneth P.

ATMOSPHERIC POLLUTION BY AEROALLERGENS. *Michigan Univ., Ann Arbor, Research Grant AP-00001, 18p., Jan. 12, 1971. 6 refs.*

Experimental results are reported for studies on (1) dose-response relationships for pollen in subjects with isolated allergic rhinitis; (2) nasal responsiveness to histamine; (3) samplers for particulate aeroallergens; and (4) lymphocyte transformation by pollen extract. Subjects with isolated ragweed pollen sensitivity showed accelerated nasal obstructive reactions when challenged with 800-1000 grains/cu m short ragweed pollen in October and November compared to their responses when challenged the following winter. A (variable) progressive increase in reactivity was observed also during sequential daily exposures carried out extraseasonally. Normal subjects and asymptomatic atopic subjects showed no difference in response with regard to the effect of atomized histamine phosphate on nasal patency. Persons with recently resolved seasonal symptoms or concurrent perennial sensitivities showed comparatively intense nasal reactivity to low concentrations of histamine. Significant undersampling of both large and small particles by the intermittent rotobar sampler became apparent in comparisons with Burkard spore trap collections. Sampling of homes with the Andersen sampler showed the prominence of small-spored types such as Oospora, Verticillium, and yeasts. Open culture plates were comparatively poor indicators of the type and extent of contamination present. Lymphocyte transformation by ragweed extract clearly occurred in both normal humans as well as autologous plasma. It did not occur when autologous or normal human serum was used as the medium.

11837 APTIC NO. 28939

Nawa, Kazuhiko

EFFECTS OF SO2 CONCENTRATION IN THE ATMOSPHERE ON DUST EXHAUSTION I RESPIRATORY TRACT. *(SO2 gasu nodo no kido haijin noryoku nioyobosu eikyo). Text in Japanese. Nagoya Shiritsu Daigaku Igakkai Zasshi (J. Nagoya City Univ. Med. Assoc.), 18(1):49-71, May 1967. 58 refs*

Eighty-eight mature male rabbits were exposed to air containing 3, 5, 10, or 20 ppm sulfur dioxide for 20 min. daily for 5 consecutive weeks. About 7 cm of the respiratory tract was taken out of the rabbit and charcoal powder less than 80 microns in diameter was fed to the tract. From the distance traveled by the powder during a certain time period, the dust expulsion rate was obtained. The rate was not affected by 3 ppm SO2; 5 ppm of SO2 caused the rats to increase during the first 2 weeks and then recover to the initial value. For concentrations of 10 and 20 ppm SO2, the rate gradually decreased during the first 3 weeks and subsequently showe a tendency to recover. The greater the SO2 concentration, the more the rate decreased and the slower its recovery. Body weight, blood cell and leukocyte counts, hemoglobin by Sahli-Komiyayama method, and hematocrit value by capillary method were also monitored. No effects were observed for concentrations of 3 ppm SO2. For SO2 concentrations higher than 5 ppm, the body weight decreased during the first 2-3 weeks and subsequently tended to recover. The leukocyte count, on the other hand, rapidly increased during the first week and subsequently recovered. The blood cell count increased during the first 2 weeks for 5 ppm SO2 and decreased during the first 3 weeks for 10 and 20 ppm SO2. The same tendency was observed for hemoglobin and hematocrit values. An interpretation of the results is given.

11838 APTIC NO. 28947

Schmaell, D.

EXOGENOUS FACTORS IN HUMAN CARCINOGENESIS AND METHODS OF DETERMINING THEM. *(Factores exogenos da cancerigenese humana e modos da sua determinacao). Text in Portuguese. Bol. Do Inst. Port. Oncolog. Francisco Gentil (Lisbon), 36(3):1-5, March 1969.*

The important influence of exogenous factors in the appearance of cancer is to be seen in the variations in localization that occur in various geographical locations. For example, cancer of the oral cavity accounts for about 35% of the cancer cases in such countries as India, whereas the same localization is found in only 1% of the cancer cases in Europe, a factor attributed to the chewing of betel nuts and tobacco leaves. More than 90% of all recorded cases of cancer are thought to be caused by exogenous factors. The carcinogens of two important categories are discussed: (1) aromatic hydrocarbons such as 3,4-benzopyrene, which generate tumors at the point of contact, and (2) aromatic amines (nitrosamines), which generate tumors after they are absorbed by the parenchymatous tissues of body organs. B.P. (3,4-benzopyrene) is present in the atmosphere of large cities in concentrations above 700 micrograms per thousand cubic meters, so that a person living in this environment will breath about 16 mg of B.P. in a lifetime. The principal sources of B.P. are automotive exhaust and the emissions of certain industries. B.P. is not only breathed but can also infiltrate vegetables and meat. The washing of vegetables contaminated with B.P. removes about 10% of the substance. Various other sources of carcinogens, not related to air pollution, are summarized.

11839 APTIC NO. 28972

Matsumura, Yukio

THE EFFECTS OF OZONE, NITROGEN DIOXIDE, AND SULFUR DIOXIDE ON THE EXPERIMENTALLY INDUCED RESPIRATORY DISORDER IN GUINEA PIGS. II. THE EFFECTS OF OZONE ON THE ABSORPTION AND THE RETENTION OF ANTIGEN IN THE LUNG. *Am. Rev. Respirat. Disease, vol. 102:438- 443, 1970. 9 refs. (Presented at the Japan Society of Chest Diseases, Annual Meeting, 9th, and the First Asia Pacific Congress on Diseases of the Chest, Kyoto, Japan, July 1969.)*

The effects of ozone on the absorption and retention of infused antigenic substance in the lungs of guinea pigs were investigated. Egg albumin was labeled with I(131), and the solution was infused into the trachea. One hour before the infusion, one half of the animals were exposed to 8 ppm ozone for 30 min. The radioactivity in the blood was followed for three hours. The mean radioactivity in the blood of 12 animals preexposed to ozone increased much more rapidly and was significantly higher than that of 11 control animals. All animals were sacrificed 24 hrs after the infusion to measure the radioactivity remaining in the lung. The mean ratio of lung radioactivity to the dose given was twice as high in the group treated with ozone. Ozone thus facilitates the absorption of infused egg albumin from the lung and prolongs its retention in the lungs of guinea pigs. On this basis, it should receive more attention from the immunologic point of view. (Author abstract modified)

11840 APTIC NO. 29002

Sutter, Ernst

DUST MEASUREMENTS DURING THE PNEUMATIC APPLICATION OF CONCRETE (GUNIT, TORKRET) IN UNDERGROUND STRUCTURES. *(Staubmessungen beim Auftragen von Spritzbeton (Gunit, Torkret) in Untertagebauten). Text in German. Staub, Reinhaltung, Luft, 31(2):56-57, Feb. 1971. 3 refs.*

Dust emission resulting from the spraying of concrete was measured because cases of silicosis were reported among crews engaged in this work. Standard impingers and microsorban filters were used for sampling. The dust samples following dust quantity determination were subjected to sedimentation analysis and particle size distribution was determined. The silica content in 59 samples from 6 different construction sites was found to be between 5-15%. The median dust concentrations fluctuated between 20 and 150 mg cu m, dust concentrations of particles smaller than 5 micron fluctuated between 3 and 30 mg cu m. These levels are very high even though the silica content is usually lower than 10%. Personnel engaged in this work should wear masks where possible and should be under medical control.

11841 APTIC NO. 29022

Portsendoerfer, J.

STUDIES ON THE GROWTH OF INHALED AEROSOL PARTICLES IN THE RESPIRATORY TRACT. *(Untersuchungen zur Frage des Wachstums von Inhalierten Aersolteilchen im Atemtrakt). Text in German. J. Aerosol Sci., 2(1):73-79, Feb. 1971. 26 refs.*

The change of the particle size of soluble and insoluble aerosols at such relative humidities as are found in the lung was investigated. The change of the particle size was determined by measuring the different attachment velocity of radioactive radon (220) decay products to the particles before and after moistening. The measurements were applied to sodium chloride, silicon dioxide, monodisperse polystrene latex particles, cigarette smoke, and atmospheric aerosol. (Author abstract)

11842 APTIC NO. 29027

Matsumura Yukio

THE EFFECTS OF OZONE, NITROGEN DIOXIDE, AND SULFUR DIOXIDE ON THE EXPERIMENTALLY INDUCED ALLERGIC RESPIRATORY DISORDER IN GUINEA PIGS. I. THE EFFECT ON SENSITIZATION WITH ALBUMIN THROUGH THE AIRWAY. *Am. Rev. Respirat. Diseases, vol. 102:430-437, 1970. 27 refs.*

The effects of preexposure to ozone, nitrogen dioxide, and sulfur dioxide at various concentrations on sensitization with albumin through the respiratory airways in guinea pigs were investigated. Egg albumin and bovine serum albumin were used as the sensitizing antigens. The degrees of sensitization the animals preexposed to a gas and control animals were compared by the prevalence of anaphylactic attack after inhalation of antigens, by active cutaneous anaphylaxis tests, and by serologic tests, such as the indirect hemagglutination test. Repeated 30-min preexposure to more than 5 ppm oxone, 70 ppm nitrogen dioxide, and 330 ppm sulfur dioxide enhanced sensitization via the airways in guinea pigs. One ppm ozone, 40 ppm nitrogen dioxide, and 180 ppm sulfur dioxide, however, showed no such effects. Repeated preexposure to 10 ppm ozone did not affect antibody formation against intraperitoneally introduced albumins. (Author abstract modified)

11843 APTIC NO. 29036

Hounam, R. F.

THE DEPOSITION OF ATMOSPHERIC CONDENSATION NUCLEI IN THE NASOPHARNGEAL REGION OF THE HUMAN RESPIRATORY TRACT. *Health Phys., 20(2):219-221, Feb. 1971. 7 refs.*

Deposition of condensation nuclei in the nasopharyngeal (NP) region of the human respiratory tract was calculated by measuring the number concentration of the nuclei leaving the mouth at flow rates from 5 to 35.1 reciprocal min and comparing the results with measured room concentration. The calculated deposition values are shown in a graph that indicates deposition increases at low flow rates. Diffusion is thus the dominant factor in the deposition of condensation nuclei in the NP region of the respiratory tract. The diffusional coefficient of the small particles was 5 times 0.0001 sq cm reciprocal sec.

11844 APTIC NO. 29043

Osaka Prefecture (Japan), Suita Public Health Center

REPORT ON THE SURVEY ON EFFECTS OF POLLUTION OF LIVING ENVIRONMENT- SURVEY OF

POLLUTION FROM MORITA CHEMICAL CO., LTD. IN SOUTHERN SUITA CITY. *(Seikatsu kankyo osen eikyo chosa hokoku - minami fukita chiku ni okeru morita kagaku kogyo kabushiki kaishi kogai ni kansuru jintai eikyo chosa). Text in Japanese. 48p, July 1970.*

On Aug. 27, 1969, a newspaper reported that about 18 hectares of paddy field rice died because of the effect of hydrogen fluoride in the neighborhood of a chemical company. An investigation revealed that large amounts of HF were emitted during a power failure on the night of July 3, 1969. The chemical company's major products are hydrofluoric acid and aluminum fluoride. Damage to farm land, agricultural products, trees, and tin-plated iron sheet roofing from HF was repeated yearly despite the expansion of production at the factory and their efforts to improve the situation. Between September 1960 and October 1967 there were 15 disputed cases between the residents and the factory. The maximum fluorine concentration detected was 0.059 mg/cu m and the average concentration was was 0.016 mg/cu m in the plot next to the factory. A medical survey showed symptoms such as cough, phlegm, nausea, and throat irritation in people who stayed home. The same sort of respiratory disturbances were observed in the other similar areas. Fifty-nine percent of the people were over 40 years old. No clear-cut effects were observed ophthalmologically and otorlaryngologically. Among infants, a high ratio of reddish pharynx and an abnormal respiratory sound were observed. It was coincuded that at present concentrations there are no immediate and serious effects anticipated, but since the pollution is expected to continue in the future, immediate steps should be taken.

11845 APTIC NO. 29047

Jores, Arthur

WEATHER, CLIMATE AND MAN. *(Wetter, Klima and Mensch). Text in German. Muenchener Medizinische Wocheschrift (Munich), 113(11):361-363, March 12, 1971. 2 refs.*

It is not sufficient to study the influence of the physical parameters of weather, climate, and environment on humans; their psychological effects demand the same consideration. This can be demonstrated particularly with asthmatics persons. They are mostly hypersensitive to dirt, dust, and pollution. The beneficial effect of high altitudes can be explained not only by the clean and allergen-free air but also on psychological grounds. (Author summary modified)

11846 APTIC NO. 29069

Higgins, Ian T. T.

EFFECTS OF SULFUR OXIDES AND PARTICULATES ON HEALTH. *Arch. Environ. Health, 22(5):584-590, May 1971. 59 refs. (Presented at American Medical Association Convention Annual, 118th, Symposium on Chronic Pulmonary Insufficiency and Problems of Air Pollution, New York, July 16, 1969.)*

Acute episodes of high pollution have led to excesive mortality and morbidity. Daily measurements of pollutants have been correlated with increased mortality and morbidity for all causes and for certain respiratory diseases. Epidemiological studies to determine significant correlations have been done comparing a variety of geographical locations, different social classes, uniform occupational groups, different towns, and different areas of the same town. Although pollution chiefly effects those who already suffer from disease, particularly of the heart or lungs, some evidence, particularly in studies of children, suggests that pollution can initiate disease as well as exacerbate it. Other studies have been done focusing on the effects of pollution on migrants, athletic performance, and lung cancer. Laboratory studies of humans exposed to sulfur oxides and particulates have demonstrated increased airway resistance and physiologic changes.

11847 APTIC NO. 29074

Fruhmann, G., M. Barth, I. Schmid, and H. Antweiler

BYSSINOSIS IN SOUTHERN GERMANY. CLINICAL AND EXPERIMENTAL STUDIES. (Byssinose in Sueddeutschland. Klinische und experimentelle Untersuchungen). Text in German. Muenchener Medizinische Wochenschrift (Munich), 113(7):209-217, Feb. 12, 1971. 23 refs.

In a study of 125 workers from factories which clean cotton, 0 to 58% (average 33%) suffered from byssinosis which is characterized by dyspnea, a restricted feeling in the chest, and general exhaustion, usually appearing on the first day of the work week. As the week progresses the symptoms disappear. Of those suffering from byssinosis, 46% showed limitation of lung functions. This was also found in 17% of the workers without symptoms. The mean 1-sec capacity (Tiffenau's Test) in the first second is slightly but significantly decreased in patients with byssinosis. Mean bronchial-flow resistances increase with the severity of the disease. There was an increase in bronchial signs in the lower fields of the thoracic X-rays and a clinically demonstrable bronchitis (the latter in 47% of the byssinosis patients) in the cotton workers with and without byssinosis, as compared to 1000 metal workers. Inhalation tests with an aqueous extract of carding dust were of no diagnostic significance. Precipitating antibodies were frequently found in the serum of cotton workers with or without byssinosis. There were no clinical suggestions of a generalized release of histamine as a result of the inhalation of the carding dust extract. Signs of a local histamine release were only observed in intracutaneous tests.

11848 APTIC NO. 29081

Timbrell, V., J. W. Skidmore, A. W. Hyett, and J. C. Wagner

EXPOSURE CHAMBERS FOR INHALATION EXPERIMENTS WITH STANDARD REFERENCE SAMPLES OF ASBESTOS OF THE INTERNATIONAL UNION AGAINST CANCER (UICC). *J. Aerosol Sci., 1(3):215-223, Aug. 1970. 13 refs.*

Five International Union Against Cancer (UICC) samples are available for use in animal experiments designed to study the biological effects of different types of asbestos. The samples also provide reference standards for comparison with other asbestos samples. A low-cost animal exposure chamber of simple design is described which meets the requirements of inhalation experiments with the samples. The chambers can accommodate small animals in groups large enough for experiments to produce statistically valid results. The animals can be serviced without being removed for the chambers; as a result, they can be exposed for long periods with minimal contamination. Full protection of the operators is provided. This is essential as the reference samples contain a high a high proportion of respirable-size dust and must be treated as potentially dangerous. To enable exposures to be compared, it is recommended that dust monitoring equipment should include a gravimetric-size selective sampler for collecting the 'respirable' fraction of a dust cloud. (Author abstract modified)

11849 APTIC NO. 29084

Suzuki, Takeo, Kiyofumi Ishikawa, Yukio Matsumura, and Sadao Orita

A STUDY ON THE HEALTH EFFECT OF AUTOEXHAUST. *Bull. Inst. Public Health (Tokyo), 19(1):28-38, March 1970. 13 refs. (Presented at the Japan Air Pollution Society, Annual Conference, 7th, 1966.)*

The effect of auto exhaust on policemen, students, and residents in Tokyo was determined for a heavy intersection and a residential area not affected by traffic in September of 1965. A measurement of carboxyhemoglobin in the blood was used as an index of the effect of carbon monoxide. The average COHb content in residents living at higher and lower levels of air pollution were 4.27 and 2.79% respectively and the content at the former area varied only from 4.17 to 4.37 for ten hours. Therefore, the residents at the higher level of pollution were affected more seriously by auto exhaust than those at the lower level; however, it was uncertain whether the subjects smoked or not. The average COHb content for policemen and students varied from 2.62 to 3.75% during their six hour exposure at the intersection. The number fo cars passing through the intersection correlated closely with the atmospheric CO concentration. Further, the average COHb content exceeded 5% when atmospheric CO concentration exceeded 10 ppm for more than one hour. But no quantitative relation could be obtained between the average COHb content and the atmospheric CO concentration. (Author abstract modified)

11850 APTIC NO. 29097

Matsumura, Yukio

THE EFFECTS OF OZONE, NITROGEN DIOXIDE, AND SULFUR DIOXIDE ON THE EXPERIMENTALLY INDUCED ALLERGIC RESPIRATORY DISORDER IN GUINEA PIGS. II. THE EFFECT OF THE OCCURRENCE OF DYSPNEIC ATTACKS. *Am. Rev. Respirat. Disease, vol. 102:444-447, 1970. 11 refs. (Presented at the Japan Society of Chest Diseases, Annual Meeting, 9th, and the First Asia Pacific Congress of Diseases of the Chest, Kyoto, Japan, July 1969.)*

Female guinea pigs were studied for the effects of pre-exposure to ozone, nitrogen dioxide, and sulfur dioxide on the occurrence of anaphylactic dyspnea experimentally provoked by antigen inhalation. A mixture of egg albumin and bovine serium albumin was used as sensitizing antigen. The antigen solution was injected intraperitoneally so all animals would be sensitized equally and would later have only a slight anaphylactic attack after inhalation of antigen aerosols. The results of the study revealed that a single 30-min exposure to more than 2 ppm 03 and to more than 40 ppm NO2 made the symptoms of anaphylactic dyspnea much more severe. Exposure to SO2 concentrations as high as 400 ppm did not show the effect seen in the experiments with 03 and NO2. It is suggested that the increase of respiratory flow resistance caused by 03 and NO2, if due to increased mucus in the airway rather than bronchoconstiction, may have enhanced the symptoms of anaphylactic dyspnea. On the other hand, 03 and NO2 have been reported to increase the susceptibility of guinea pigs to histamine. If 03 and NO2 change the sensitivity to chemical mediators such as histamine, exposure to these gases might also affect the severity of dyspneic attack provoked by antigen inhalation. (Author abstract modified)

11851 APTIC NO. 29109

Izmerov, N. F.

SOME BIOLOGICAL ASPECTS OF AIR POLLUTION. *World Health Organization Chronical (Geneva), 25(2):51-57, Feb. 1971. 20 refs.*

The determination of harmless concentrations of air pollutants involves the biological problem of the physiological boundaries of the organism's adaptation to the environment. Adaptation as a result of chronic exposure to toxic substances is of an obviously pathological nature and often purchased at the price of considerable morphological and functional changes. Thus, to maintain normal interrelationship between the organism and its environment, it is extremely important to determine the boundary between physiological adaptation, which does not involve stress and pathological reactions requiring compensations of disturbed function. For this purpose, the biological effects and hygienic significance of atmospheric pollutants must be defined with the aid of a variety of scientists, e.g., physicians, physicists, chemists, toxicologists. It is impossible to accept concentrations of atmospheric pollutants at and above which there is likely to be irritation of the sensory organs, for such irritation can only be dangerous.

11852 APTIC NO. 29112

Bohlig, H., A. F. Dabbert, P. Dalquen, E. Hain, and I. Hinz

EPIDEMIOLOGY OF MALIGNANT MESOTHELIOMA IN HAMBURG: A PRELIMINARY REPORT. *Environ. Res., 3(5-6):365-372, Dec. 1970. 31 refs.*

More than 250 diffuse malignant pleural mesotheliomas were observed in Hamburg from 1958 to 1968. Of this number, 119 cases were studied with reference to residence and occupational histories and histological diagnosis. A striking concentration of cases (51) was found around a large asbestos processing factory. Occupational exposure was ascertained in 55 cases. Four mesothelioma patients showed asbestosis of the lungs, three of them having been exposed occupationally. Inadequate information was available concerning smoking habits and the importance of various kinds of asbestos in the pathogenis of mesothelioma. (Author abstract modified)

11853 APTIC NO. 29116

Hounam, R. F., A. Black, and M. Walsh

THE DEPOSITION OF AEROSOL PARTICLES IN THE NASOPHARYNGEAL REGION OF THE HUMAN RESPIRATORY TRACT. *J. Aerosol Sci., 2(1):47-61, Feb. 1971. 11 refs.*

Experiments were made to measure the deposition of radioactive monodisperse polystyrene particles (between 1 and 10 micrometer diameter) aspirated through the nose and the mouth at known flow rates. The experimental arrangements permitted the pressure difference across the nose and mouth of 24 subjects to be determined as deposition occurred. When, for particles of the same size, deposition was plotted against flow rate there was considerable scatter in the results. A much better correlation was obtained with pressure difference, which is a complex function of interrelated variables all of which may influence deposition. Values of the pressure difference across the nose and mouth for the 24 subjects were found to be similar to values for pressure difference across the nasal passages and nasopharnyx of the same subjects while breathing normally. The similarity of the values suggest that deposition in the mouth is likely to be a relatively small proportion of the total. (Author abstract modified)

11854 APTIC NO. 29120

Shcheglova, A. I. and I. S. Breslav

REACTIONS OF CERTAIN RODENTS TO GAS GRADIENTS IN THEIR ENVIRONMENT. *Dokl. Biol. Sci. (English translation from Russian of: Dokl. Akad. Nauk SSSR), 180(2):252-254, May/June 1968. 7 refs.*

Desert rodents (great gerbil, midday gerbil, tamarisk gerbil, and bandicoot rat) who normally live in burrows where an accumulation of carbon dioxide gas, and a partial reduction in oxygen pressure, may take place were studied for their gas preference. The animals were exposed in a gas-gradient apparatus, at one end of which the gas composition was similar to that of the normal atmosphere; at the other end, the oxygen content of the air was either reduced or increased, or there was an increase in carbon dioxide concentration. The great gerbil, the tamarisk gerbil, and the bandicoot rat showed no significant reactions to surplus oxygen or surplus carbon dioxide. Neither were they adversely affected by reduced oxygen, the great gerbil even showing a preference for this medium. In contrast, the midday gerbil was comparatively sensitive to a shortage of oxygen and an excess of carbon dioxide, preferring surplus oxygen. The fact that the observed reactions agree well with the ecological characteristics of these animals suggests that gas preference indices can be used to specify the adaptability of an animal to a definite gas composition in the surrounding medium.

11855 APTIC NO. 29129

Yagyu, Hiroshi, Kiyoshi Morozumi, Masatake Kobayashi, Soji Yamazaki, Yasuhito Sato, and Shingo Ikeda

ENVIRONMENTAL CONDITIONS AT A TOLL-GATE BOOTH AND THEIR INFLUENCE ON THE LABORS' HEALTH. *(Yuryodoro ryokinsho kankyo no ryokin shujuin ni oyobosu eikyo ni tsuite). Text in Japanese. Tokyo-Toritsu Eisei Kenkyusho Nenpo (Annu. Rept. Tokyo-to Lab. Med. Sci.), no. 21:129-146, 1969. 8 refs.*

During three days in December 1969, a survey was made on the environmental conditions of toll-gate business and on health of workers at the booth of a toll-gate near Tokyo. The quantity of carbon monoxide and other substances in automobile exhaust was measured. Blood and urine was examined and fatigue was observed, in order to know whether exhaust gases effect the human body acutely or chronically. The effect of oxygen inhalation as countermeasure against the exhasut gas was also examined. The concentration of CO gas was 10 ppm when wind speed was 3-5 m/sec, but in the dead calm it indicated over 30-50 ppm. The concentration of nitric oxide gas was fairly high, indicating 1.20-1.37 ppm from 8:00 am to 12:00 and the maximum concentration of nitrogen dioxide gas was 0.22 ppm. The average weight of dust in the air was 0.74 mg/cu m (1.02 mg/cu m maximum and 0.45 mg/cu m minimum); that of lead was 12.7 mg/cu m average (17.2 mg/cu m maximum and 9.0 mg/cu m minimum); and that of silica dehydrate was 0.12 mg/cu m average (0.23 mg/cu m maximum and 0.03 mg/cu m minimum). All these were less than the permissible concentrations in the labor standards law. According to the survey results by C.M.I., there were a little more complaint about abnormalities in the circulatory system, but they had nothing to do with the length of employment. Examination of urine indicated comparatively more quasi-positive albuminuria in the people over 40 years old and working under 3 years. The amount of lead in blood and urine had nothing to do with the age and length of employment. Subjective fatigue and two-points touch-discrimination were investigated, showing some effect with inhalation of oxygen, but no significant effect in the carboxyhemoglobin % in blood. Cigarette smoking had a greater influence in the investigation of fatigue. Under these circumstances, the environmental conditions of the workers at a toll-gate booth were considered beyond the permissible limits of the standards law.

11856 APTIC NO. 29134

Drees, Werner and Benno Busek

ADSORPTION OF GASES AND DUSTS. *(Gasadsorption an Staeuben). Text in German. Frieburger Forschungsh A, no. 456:113-121, 1970. 4 refs.*

The degree of adsorption of gases on dusts is important especially in underground mining where blasting with Dekamont was found to load dust with 0.72% ammonium nitrate. The degree of adsorption of carbon monoxide, oxides of nitrogen and sulfur dioxide was therefore determine experimentally on various adsorbents including silica dust of particle size below 5 micron, on $BaSO_4$ dust, on NaCl, KCl, K_2SO_4 and Na_2SO_4 dusts, on kieserite dust, on carnallite dust, on $CaSO_4.2H_2O$, $CaSO_4.$ 1/2 H_2O, $CaSO_4$, $BaSO_4$ and $CaCO_3$ dusts. The adsorption of CO on the dusts was found to be small. Most of CO remains in the gaseous phase. During the removal of blasting debris CO penetrated into the atmosphere and locally exceeded maximal permissible concentrations. The sorption of nitrogen oxides is considerably higher but under conditions prevailing in mines even with dust concentrations of 100 g/cu m the maximal permissible level was seldom exceeded. Even under unfavorable conditions NO_2 adsorbed on dust does not present a health hazard. No desorption of nitrogen oxides was observed with KCl and NaCl dusts. Adsorption values for SO_2 were found to be of the same order of magnitude or below that of magnitude or below that of NO_2. Adsorption of SO_2 on dusts also does not represent a health hazard.

11857 APTIC NO. 29136

Hexter, Alfred C. and John R. Goldsmith

CARBON MONOXIDE: ASSOCIATION OF COMMUNITY AIR POLLUTION WITH MORTALITY. *Science, 172(3980):265-267, April 1971. 8 refs.*

Regression analysis was applied to the total number of deaths occurring in Los Angeles County each day from January 1, 19962 through December 31, 1965 and to measurements of temperature, carbon monoxide, and total oxidant. A significant association was found between community carbon monoxide concentrations and mortality. Cyclic variation and maximum temperature were the main contributors. The estimated contribution to mortality for Los Angeles County for an average carbon monoxide concentration of 20.2 ppm (the highest observed during the four-yr period), as compared with an average concentation of 7.3 ppm (the lowest observed), is 11 deaths for that day. No association was demonstrated between oxidant and mortality. (Author abstract modified)

11858 APTIC NO. 29154

Hernberg, Sven, Gunnar Mowe, Pertti Virkola, Timo Partanen, and Claes-Henrik Nordman

MAGNESIUM AND ZINC VALUES OF ERYTHROCYTES AND PLASMA FOR WORKERS EXPOSED TO CARBON DISULPHIDE. *Work Environ. Health (Helsinki), 6(2):9-13, 1969. 16 refs.*

Results are reported for atomic absorption spectrophotometric measurements of zinc and magnesium in erythrocytes and plasma of Finnish and Norwegian rayon viscose workers occupationally exposed to carbon disulfide. The results are compared to those for controls. Thirty-one Finnish rayon viscose workers had about 10% lower eruthrocyte magnesium levels than their controls (t equals 4.61, p less than 0.001). The mean erythrocyte zinc concentration was also slightly lower for the exposed group (t equals 2.08, p less than 0.05), but the difference may be due to random error. There was no statistically significant difference between the corresponding measurements for 54 exposed and 49 unexposed Norwegian men. Plasma magnesium levels in 1959 exposed Finnish workers were 8% higher than in 250 controls; the mean concentration for the exposed group was t equals 9.65, p less than 0.001. Differences in plasma magnesium levels among 54 exposed and 61 unexposed Norwegian workers were insignificant. Plasma zinc values of 108 exposed and 215 unexposed Finnish workers were almost identical. The fact that statistically significant differences were found only for Finnish workers suggest that some factor other than carbon disulfide might have been responsible for the observed levels.

11859 APTIC NO. 29165

Schneider, Lawrence K. and Charles A. Calkins

SULFUR DIOXIDE-INDUCED LYMPHOCYTE DEFECTS IN HUMAN PERIPHERAL BLOOD CULTURES. *Environ. Res., 3(5-6):473-483, Dec. 1970. 16 refs.*

Human lymphocyte cultures were prepared from peripheral blood of healthy males by a standard technique utilizing phytohemagglutinin. Nine cultures were established in each of five experiments. One, designated control, was allowed to grow without interruption for three days. Each experimental culture received a single exposure to 100 cc of 5.7 ppm sulfur dioxide in air by bubbling the gas through the culture medium at 0, 1, 2, or 3 days of incubation. An additional four cultures received an identical amount of the same quality of air minus the SO2 at each time interval. All cultures were harvested as smears and hypotonic spread preparations at 72 hrs after treatment for one hr with cochine and 3H-thymidine. Statistical analyses revealed significantly reduced cell growth (enlargement), DNA synthesis, and mitotic indices in the cultures exposed to SO2 at initiation of incubation compared to controls and air-treated cultures. In addition, chromosome abnormalities, mainly in the form of clumping, were observed in the SO2-treated cultures. Lymphocyte damage as caused by SO2 exposure is offered as one explanation for the reduced immunological responses observed in laboratory animals after inhalation of the gas in vivo. (Author abstract)

11860 APTIC NO. 29183

Cross, C. E., A. B. Ibrahim, M. Ahmed, and M. G. Mustafa

EFFECT OF CADMIUM ION ON RESPIRATION AND ATPASE ACTIVITY OF THE PULMONARY ALVEOLAR MACROPHAGE: A MODEL FOR THE STUDY OF ENVIRONMENTAL INTERFERENCE WITH PULMONARY CELL FUNCTION. *Environ. Res., 3(5-6):512-520, Dec. 1970. 47 refs.*

A study was made of the effect of cadmium (2+) on respiration and adenosinetriphosphatase activity of pulmonary alveolar macrophage (PAM) cells. Approximately, 5 mM Cd(2+) inhibited endogenous respiration in PAM cells and 0.5 mM Cd(2+) inhibited respiration in mitochondria of PAM cells. Tetramethyl-p- phenylenediamine, an artificial electron carrier, restored the CD(2+) presumably bound certain respiratory chain components. Cadmium ion also inhibited the Na(+) - K(+), Mg(2+) ATPase system of PAM cells and cellular membranes. The interaction of this metal ion with the vital processes of respiration and energy transfer in PAM cells might relate to pulmonary pathology arising from occupational and environmental exposure to cadmium. It is hypothesized that the biochemical alterations of pulmonary cells may be more sensitive and easily discernible parameters of the manifestations of noxious inhalants than the conventional pathophysiological parameters. (Author abstract modified)

11861 APTIC NO. 29192

Nasr, Ahmed N. M., Bertram D. Dinman, and I. A. Bernstein

AN EXPERIMENTAL APPROACH TO STUDY THE TOXICITY OF NONPARTICULATE AIR POLLUTANTS. *Arch. Environ. Health, 22(5):538-544, May 1971. 14 refs.*

An experimental model was developed for the study of the toxicity of nonparticulate air pollutants. Changes in chemical composition of lung tissue homogenate, following inhalation of a noxious gas, could neither be traced to a particular tissue component, nor be regarded as solitary unrelated incidents. Biochemical changes in a single kind of cell, separated from the respiratory tract after the animal's exposure to poisonous gas, were thought to be more directly related to the toxic mechanism of the investigated gas. A technique for isolating epithelium lining the rat trachea was adopted from a method used to separate tracheal and bronchial epithelia from human autopsy material. Ozone was chosen as test gas in this experimental approach because of its importance in photochemical smog and its presence in certain industrial environments. During the exposure period the animals became lethargic after a few minutes, and soon their breathing was labored. Gross examination of the lungs after inhalation of ozone revealed congestion and subpleural hemorrhages. Histological examination of the trachea, excised immediately after exposure of the animal to ozone, revealed no abnormality that could be detected with the light microscope. The extent of removal of the epithelium by the method described was studied by examining histological sections of the trachea before and after separation of the cells. (Author abstract modified)

11862 APTIC NO. 29193

Kloene, W., F. B. Bang, S. M. Chakraborty, M. R. Cooper, H. Kulemann, M. Ota, and K. V. Shah

A TWO-YEAR RESPIRATORY VIRUS SURVEY IN FOUR VILLAGES IN WEST BENGAL, INDIA. *Am. J. Epidemiol., 92(5):307-320, Nov. 1970. 23 refs.*

A respiratory virus survey was carried out in four villages in an agricultural region near Calcutta from May 1964 through April 1966. Throat specimens were collected from the youngest child (under 5 years of age) of about 10% of the total number of families in each village at monthly intervals and processed in rhesus monkey kidney and HEp-2 cell cultures. During the two- year study period a total of 4171 specimens were processed; 625 virus isolates were obtained, 483 of these were initial isolations. All common types of respiratory viruses were recovered from the oropharynx of members of the study population at various times. Infections with the parainfluenza virus types 1, 2, 3, and 4B, respiratory syncytial virus and adenoviruses types 3 and 6 occurred in sharply defined outbreaks. Whereas infections with the parainfluenza viruses types 1, 2, and 3, and respiratory syncytial virus were widely spread throughout the village areas, infections with parainfluenza virus type 4B and adenoviruses types 3 and 6 were limited in their geographic spread and showed a tendency to cluster. Adenoviruses types 1 and 2, and to a lesser extent type 5 were located almost continuously during the study period. Waves of increased recovery of adenoviruses types 1 and 2 were observed in some of the villages. Isolations of adenoviruses types 1 and 2 were obtained from study children scattered over the whole study area, whereas those of adenovirus type 5 showed a tendency to cluster and were recovered from less than half of the study area. No seasonal influence on the prevalance of respiratory viruses was observed, with the possible exception of respiratory syncytial virus. The wide variety of respiratory viruses recovered during the study period, their spread through the study area, and the high incidence of infections with these viruses among members of the study population, reflect a high level of respiratory virus activity in village communities living under poor hygienic conditions in the hot climatic zone. (Author abstract)

11863 APTIC NO. 29194

Dalhamn, Tore, Ake Rosengren, and Ragnar Rylander

NASAL ABSORPTION OF ORGANIC MATTER IN ANIMAL EXPERIMENTS. *Arch. Environ. Health, 22(5):554-556, May 1971. 4 refs.*

As the majority of animal experiments on tobacco smoke involve an exposure situation in which the animals inhale smoke through their nares, sufficient knowledge of the exposure agent at the site of action in the lungs cannot be considered to exist if the absorptive capacity of the nasal pathways has not been determined. An experimental setup is described to study the absorptive capacity of the nasal pathways for organic matter in laboratory animals, and preliminary data are reported on the absorption of cigarette smoke in living rabbits. The experimental equipment consists of two gas analyzers and two recorders, one of each serving the gas stream which has passed through the nose of a living animal, and the reference gas stream, respectively. Results suggest that a significant amount of smoke is absorbed; the mean value from eight animals of organic matter absorbed was 32%. (Author abstract modified)

11864 APTIC NO. 29196

El-Refai, Abdel R., Makarem El-Essawi, Nadia El-Essawi, and Fayza Risk

HAZARDS FROM AERIAL SPRAYING IN COTTON CULTURE AREA OF THE NILE RIVER. *Arch. Environ. Health, 22(3):328-333, March 1971. 9 refs.*

Groups of unprotected persons selected because of their exposures to low-volume pesticide sprays resulting from their occupations or from their residing in treated areas were studied for evidence of poisoning. From survey of blood cholinesterase activity and urinary p-nitrophenol excretion, it was quite obvious that in spite of safety violations, no critical poisoning occurred in working groups or residents. Only the groups with the highest potential exposure to pesticide mixture (mixing-plant personnel and ground applicators) showed a definite decrease in cholinesterase level during exposure. Results indicate that hazard from the agricultural use of the low-volume application of pesticide mixture by inexperienced persons under the conditions described is relatively low. However, these findings do not exclude the possibility that more toxic organic phosphorus compounds would constitute a danger if used under the same circumstances. (Author abstract)

11865 APTIC NO. 29197

Mahoney, Louis E., Jr.

WIND FLOW AND RESPIRATORY MORTALITY IN LOS ANGELES. *Arch. Environ. Health, 22(3):344-347, March 1971. 5 refs.*

As a preliminary part of a study of Los Angeles air pollution, a model of daytime wind flow over Los Angeles was constructed. The city was divided into five wind zones representing distance downwind along the path of air flow. Death rates for respiratory disease were then computed for subsets of the city population in 1961. Mortality from respiratory disease increased in successive downwind zones. This increase was independent of different age, sex, and income characteristics of the populations of the five zones. This is consistent with an effect of air pollution or of some meteorological factor associated with wind flow. (Author abstract modified)

11866 APTIC NO. 29235

Nakajima, Toshiro and Ichiro Hata

EPIDEMIOLOGICAL STUDY OF AIR POLLUTION EFFECTS IN SAGANOSEKI TOWN. *(Oita-ken Saganoseki-cho ni okeru taiki osen no kenko ni oyobosu eikyo ni tsuiteno ekigakuteki kenkyu). Text in Japanese. Taiki Osen Kenkyu (J. Japan Soc. Air Pollution), 5(1): 132, 1970. (Proceedings of the Japan Society of Air Pollution, Annual Meeting, 11th, 1970.)*

Residents of the commercial-residential area of Saganoseki, adjacent to a copper refinery with a 295-m stack, were interviewed according to the BMRC method. The sample was 1257 residents, excluding highschool students and younger children; the response rate was 82.9%. Items on the questionnaires pertained to protracted (about three months) annual coughs; coughing and phlegm occurring since two or more years ago; bronchial afflictions in the last three years and past and present asthmatic attacks. The response rate for each item was classified according to sex. The results show that many people are suffering from the respiratory symptoms due to sulfur dioxide gas, and that morbidity in the area in almost as high as in Osaka or Kobe.

11867 APTIC NO. 29244

Tokyo Metropolitan Environmental Pollutions Research Inst. (Japan), Health Dept.

REPORT OF THE SURVEY ON THE EFFECT OF CO IN ATMOSPHERE ON MEN. *(Taikichu no issanka tanso no jintai eikyo ni kansuru chosa hokoku). Text in Japanese. 26p., 1970.*

In November and December 1969, 259 Tokyo has drivers and 34 non-driving system employees were examined for the effects of carbon monoxide with respect to fatigue and reaction time and in relation to their working conditions. Drivers at one depot averaged 37.1 years of age and non-drivers 43.8. At another depot, the average ages were 36.6 and 42.4 years respectively. Outdoor concentrations of CO were about 10 ppm; indoors, for reasons including space heaters, smoking and exhalation, ranges were a few dozen ppm. One group of 75, identified as non-smokers, averaged 19.5 ppm which is the equivalent of 4% carboxyhemoglobin. This is attributed partly to hheating unit emissions and partly to residual accumulations from driving. The non-drivers constituted too small a sample for valid statistical analysis with respect to smokers or non-smokers. There was no significant variation in the COH concentration between the control group and the drivers, possibly because the control group spent the day in heated rooms. The CO measured three times daily showed little variation except that it tended to increase slightly in both drivers and non-drivers. No distinct correlation was established between length of service, height, body weight, or CO accumulation which may be due to the small sample. Drivers are apt to inhale exhaust fumes entering the buses through crevices in the floor, but there was no correlation. There was a positive correlation with CO and physical, mental, and sensory fatigue. Though the concentration varied greatly (10-30 ppm), exhalation concentration remained nearly constant.

11868 APTIC NO. 29249

Wokounova, D., K. Fried, and J. Sladek

THE RESULTS OF THE STUDY OF THE POLLUTED AIR INFLUENCE ON HEALTH OF THE KLADNO AND BUSTEHRAD INHABITANTS. THE 2ND COMMUNICATION. *(Vysledky sledovani vlivu znecisteneho ovzdusi nazdravi obyvatel Kladna a Bustehradu Sdelni II). Text in Czech. Cesk. Hyg. (Prague), 15(6):196-202, 1970. 15 refs.*

All ten year old children who lived in the areas of Kladno, Bustehrad, and Zlonice in Bohemia since their birth were medically examined and their past history of illnesses recorded. The results were grouped according to the environmental conditions under which these children lived. Three categories were established; group I, areas with a dust fall of over 500 tons per sq km per year and an average sulfur dioxide concentration around 0.5 mg/cu m, group II with a dustfall of 150-500 t/sq km/ year and an SO2 concentration of up to 0.15 mg/cu m, and group III with a dustfall up to 150 t/sq km/year and an SO2 concentration of up to 0.05 mg/cu m. It was shown that children living in very polluted areas have retarded growth and a greater morbidity rate for respiratory diseases exist. The reduction in ultraviolet radiance from dustiness and smoke in the air can cause a change in the form of symmetry of the thorax and faulty comportment of the body. Appreciable differences were found with children from groups I and II, compared with group III, with regard to erythrocytes count, hemoglobin values, color index, number of leucocytes, lymphocytes, and eosinophiles. There was no difference in serum protein level in all groups, and the rate of infectious diseases was practically the same in all three groups. Suppression of dustiness by using water curtains when dumping slag, the need for greening of older slag dumps, the general projects of dedusting and desulfurization of air, and increased electrification of interplant transportation are needed.

11869 APTIC NO. 29255

Karimova, L. K.

THE CLINICAL ASPECTS OF GRANOSAN POISONING. *Inst. of Hygiene of Labor and Industrial Diseases, Leningrad (USSR), 9p. Translated from Russian.*

Several cases of poisoning due to the accidental use in food of grain treated with ethylmercurychloride were diagnosed among families of collective farm workers. The clinical picture presented by the disease was similar to that found in diethylmercurophosphate poisoning: patients exhibited gastrointestinal disorders, marked adynamia, general exhaustion, and functional disturbances of the central nervous system. The presence of the disease was confirmed by the continuous excretion of mercury in urine. A gradual improvement in the condition of the patients was noted following intravenous injection of glucose with vitamins B1 and C and subucaneous introduction of unithiol, a new synthetic preparation recommended as an antidote in cases of arsenic and mercury poisoning.

11870 APTIC NO. 29256

Saita, G., L. Moreo, and G. Levizzani

THE BEHAVIOR OF DELTA-AMINOLEVULINIC ACID AND OF PROPHOBILINOGEN AFTER GLYCINE LOAD IN SATURNISM. *Med. Lavoro (Milan), 58(331):364-369, 1967. Translated from Italian.*

Because other tests are not always conclusive indicators of minor lead intoxication, a study was made of the behavior of delta-aminolevulinic acid (ALA) and prophobinogen (PBG) in saturnism, before and after glycine load. Prior to glycine load, two of the 10 cases studied had ALA serum values above the maximum normal limit and nine had ALA urine values above maximal normal limits. After glycine load, a noteworthy increase of the serum and ALA values was observed in all cases. No changes in PBG were found. In 10 normal subjects, no pathological ALA and PBG increases occurred in either urine or serum. It is concluded that glycine load not only makes an already existing metabolic change increasingly evident, but also permits the documentation of the changes in those cases of saturnism for which preliminary analyses failed to demonstrate any ALA changes.

11871 APTIC NO. 29276

Stock, Alfred

CHEMICAL CONTRIBUTION TO THE UNDERSTANDING OF MERCURY INTOXICATION. *(Chemische Beitraege zur Kenntnis der Quecksilbervergiftung). Text in German. Ber. Deut. Chem. Ges., 75(12), Pt. B:1530-1535, 1942. 28 refs.*

Chronic intoxication with mercury resulting from exposure to low concentrations of mercury vapors over an extended period of time was studied to explore the mode of reaction of Hg in the organism. The analytical method developed by I. Bodnar and E. Szep was used for the determination of small quantities of Hg after the colorimetric method failed. Hg is an omnipresent element generally at a level of the order of magnitude of 1-10 gamma Hg/100g. Humans eliminate daily 0.1-1 gamma Hg in urine. Inhaled Hg is much more toxic than ingested Hg. Poisoning develops over a long time but once oversensitivity develops the smallest quantity of Hg will result in characteristic depression. All means designed to neutralize Hg in the body have failed. Most of the inhaled Hg vapor remains in the nose and the upper respiratory tract; the remainder reaches the lungs. The mucous membrane swells and a catarrh develops. Hg is absorbed easily because it is quickly oxidized by blood to HgO. The kidneys store Hg from the body fluids and release it only slowly. A smaller accumulation also occurs in the liver and glands of inner secretion, especially in the hypophysis and the bulbi of olfactorii. The normal content of Hg in human muscle tissue was found to be about 0.5 gamma Hg/100 g, 2 gamma in the brain, and 10 gamma in the kidney and in the hypophysis.

11872 APTIC NO. 29282

Stupfel, M. and J. Godin

EMISSION OF CARBON MONOXIDE AND CONSUMPTION OF OXYGEN. *(Emission d oxyde de carbone et consommation d oxygene). Text in French. Compt. Rend. Soc. Biol. (Paris), 162(10):1684-89, 1968. 19 refs.*

The results of experiments with various mammals to determine the ratio of oxygen absorbed by inhalation to carbon monoxide emitted by exhalation are presented. An airtight chamber of plexiglass was used into which the experimental species were placed. In one experiment with rats, the change of the composition of the inside atmosphere was measured at regular intervals of two hours. Graphs were plotted; showing for example oxygen inhaled, as a function of bod0y weight. An average temperature of 24 C and a humidity of 75% were maintained during the experiment. Young rats showed considerably higher values of consumption and emission than older ones, although the ratio between oxygen consumed and carbon monoxide produced remained fairly constant at about 10,000:1 by volume. A similar ratio was found in other experiments conducted with several specimens of mice, rats, rabbits, and with one man.

11873 APTIC NO. 29284

Stupfel, M.

EXPERIMENTAL BRONCHITIS PRODUCED BY VARIOUS AIR POLLUTANTS. *(Bronchites experimentales par drivers polluants atmospheriques). Text in French. Bull. Physio-Pathol. Respir. (Nancy), vol. 5:485-504, 1969. 70 refs.*

A study conducted in England with workers over 45 years of age showed that absenteeism and mortality due to bronchitis occurred at a higher rate with increased sulfur dioxide pollution. These studies also indicated a relationship between mortality from bronchitis and the dust content in the air. Another study conducted with English postal employees working outdoors, revealed an increased incidence of bronchitis during periods of fog and cold weather. Other aggravating circumstances in connection with bronchitis include tobacco smoking, and exposure in industrial plants to toxic gases and chemical irritations, such as chlorine, ammonia, and sulfurous anhydride. T determine the ill effects of air pollution on the respiratory system, tests were made with animals in whom experimental bronchopneumopathies were induced under controlled conditons. Two identical chambers were used into which an equal number of a species of animals of the same age sex and weight were placed for a period of time. The inside temperature and humidity in the chambers were kept at equal values. In one chamber a normal atmosphere is maintained whereas pollutants are introduced into the other chambers. Both groups of animals are periodically examined. The dusts and chronic effects of the exposure of various animals to seven groups of pollutants were reported. The animals used were rats, mice, dogs, rabbits, hamsters, and guinea pigs. The seven pollutant groups were sulfur dioxide, various nitrogen oxides, ozone, dust, tobacco smoke, automobile exhaust gases, and aerosols. A great variation of effects of the same air pollutant on different species of animals studied was found.

11874 APTIC NO. 29286

Lob, Marc

GASOLINE WITH LEAD CONTENT. I. THE PROBLEM OF REPLACING TETRAETHYL LEAD BY TETRAEMETHYL LEAD. *(A propos de la benzine au plomb. I. Probleme du remplacement du plomb tetraethyl par le plomb tetramethyle). Text in French. Z. Praeventivmed., 10(3):164-171, 1965.*

The replacement of tetraethyl lead (TEL) with tetraemethyl lead (TML) as an antiknock agent in gasoline was studied. When injected into rats, TML produced toxic effects of less intensity than TEL. The effect of these agents on the health of employees of refineries and gasoline service stations is also important. TML is more volatile than TEL, and can cause a lead content in the air which is three times greater than TEL under comparable circumstances. However, the human being reacts less to the inhalation of TML than TEL. A set of urine tests from refinery personnel showed an average of 90 micrograms of lead per liter of urine when TEL was processed, as compared to 100 micrograms from TML, a difference of 10%. Lead content in the blood was again 10% higher from TML than from TEL. Test results from serivce station employees showed practically no difference in lead content in urine derived from persons who worked in stations selling TML compared with the findings obtained under comparable conditions from urine analyses derived from TEL gasoline station personnel. Safety precautions, wearing of gas masks, must be taken by operators in refineries who work in close contact with TML and where the atmosphere may contain as much as 200 micrograms of lead per cu m of air. For comparison, 5 to 10 micrograms per cu m were reported as average conditions in service stations in California.

11875 APTIC NO. 29316

Gerhardt, T., M. Goethert, M. Malorny, and H. Wilke

CARBON MONOXIDE UPTAKE IN HUMAN BEINGS BREATHING CO-AIR MIXTURES UNDER INCREASED PRESSURE. *(Aufnahme von Kohlenoxid in den Organismus des Meschen bei Atmung von CO-Luftgemischen unter erhoehtem Druck). Text in German. Naunyn-Schmiedebergs Arch. Pharmakol. Exp. Pathol., 266(4/5):332-333, 1970.*

The uptake by the organism of 50 and 100 ppm in air under a pressure of 2 atm was compared with respective levels of uptake at normal atmospheric pressure. Analysis of alveolar air and COHb determination disclosed that the diffusion equilibrium between alveolar air and blood at an excess pressure of 2 atm was achieved faster than at normal pressure. This is explained by the higher CO supply at an increased partial pressure of CO. The CO-HB concentration was peculiarly markedly lower in the state of equilibrium under increased than under normal pressure. This is explained by competition by CO and by O2 for the hemoglobin receptor in the blood and confirmed by calculation by the application of the mass action law.

11876 APTIC NO. 29329

Tansy, M. F. and R. P. Roth

PIGEONS: A NEW ROLE IN AIR POLLUTION. *J. Air Pollution Control Assoc., 20(5):307-309, May 1970. 15 refs.*

A pilot study was conducted to determine the lead content of the various tissues and organs of two groups of wild pigeons. One group was obtained in the City of Philadelphia. The other group was captured in rural Jefferson County, Pennsylvania. Tissue and organ lead content of both groups was assayed by means of atomic absorption spectrophotometry. Each bird was carefully examined to determine the possible presence of imbedded or ingested lead. None was found. The mean lead content per unit weight of the hard tissues of the city pigeons was significantly higher than the corresponding values for the rural birds. The blood lead content of the two groups (a parameter which is often assayed in screenings of chronically exposed human populations) did not reflect a significant difference. Possible sources of lead intake are examined and references to past literature are cited which indicate that the most significant general source of biological lead is probably atmospheric. The routine examination of wild animals that may harbor disease producing organisms or vectors is a commonly accepted procedure. The authors advance the proposition that the ubiquitous presence of certain animal pests, notably pigeons, may lend itself to a similar monitoring of the chronic uptake of atmospheric metallic pollutants. (Author abstract)

11877 APTIC NO. 29371

Godwin, M. C. and Juraj Jagatic

ASBESTOS AND MESOTHELIOMAS. *Environ. Res., 3(5-6):391-416, Dec. 1970. 29 refs.*

Seven selected cases with asbestos in the lungs and a mesothelioma in the pleura or peritoneum were studied intensively using routine methods, polarized light, incineration technique, and acid digestion. Asbestos bodies, fragments, particles, and dust were regularly found in the hilar and mediastinal nodes. Asbestos bodies were also found in lumphatics being transported to the nodes and in the spleen, abdominal tumor, and small bowel wall. Particles were observed in abdominal nodes and peritoneum, and a small mesothelioma was found arising in the pleura in a case of peritoneal mesothelioma. A squamous cell carcinoma was found in the right lung and a mesothelioma of the left pleura. It is concluded that asbestos is irritating mechanically and chemically and that it is distributed widely in the body by the lymphatics and blood resulting in malignancies of various types, with the pleura and peritoneum being especially susceptible. (Author abstract modified)

11878 **APTIC NO. 29372**

Burilkov, Todor and Liliana Michailova

ASBESTOS CONTENT OF THE SOIL AND ENDEMIC PLEURAL ASBESTOSIS. ***Environ. Res.3(5-6):443-451, Dec. 1970. 16 refs.***

Soil samples from a tobacco-growing region (of Bulgaria) with dispersed, asbestos outcroppings were analyzed. The content of fibrous minerals (anthophyllite, tremolite, sepiolite) of the soils in this region was condiderable. Endemic pleural plaques occur in the human population. Soil samples from an area with no outcroppings were also examined and were observed to be free of asbestos and other fibrous minerals. No pleural plaques were found in the farming population in this area. The results of this minerological study support the hypothesis that pleural plaques may be caused not only by occupational air pollution, but also by the inhalation of asbestiform particles derived from the soil in certain areas. (Author abstract modified)

11879 **APTIC NO. 29379**

Smith, Roger P.

SOME FEATURES OF THE REACTION BETWEEN COBALTINITRITE AND HEMOGLOBIN. ***Toxicol. Appl. Pharmacol., no. 17:634-647, 1970. 15 refs.***

Sodium cobaltinitrite, sodium nitrite, and potassium ferricyanide were compared with respect to certain aspects of their reaction with hemoglobin. A vigorous oxygen-consuming reaction occurs with the oxidation of carboxyhemoglobin by cobaltinitrite which involves the release of carbon monoxide and increased consumption of oxygen. Sodium cobaltinitrite, injected into mice, gave the same reaction produced by an equivalen dose of sodium nitrite. Human red cells were tested with various reagents. The reactions of nitrite, cobaltinitrite, and ferricyanide on hemoglobin were compared by estimating the total blood pigment with absorption spectra analyses. The oxygen bound to the heme site of the pigment, participates and is consumed in the nitrite reaction, while it is released with ferricyanide. With cobaltinitrite, a net gas evolution was observed from carboxyhemoglobin. The magnitude of this effect however, was independent of cobaltinitrite concentration, and it was considerably less than would be anticipated for quantitative release of bound carbon monoxide. Conversion to methemoglobin was complete with 17 mM cobaltinitrite. The hemolytic effects of cobaltous chloride appear to be intensified by nitrite. The reaction between cobaltinitrite and hemoglobin is quite complex and the effects of moderate cobaltinitrite in red cell suspensions or in vivo are largely due to the dissociated nitrite.

11880 **APTIC NO. 29380**

Tsuruta, Masukiyo, Kazuo Takemoto, and Kenji Namie

THE EFFECT OF AIR POLLUTION ON THE RESPIRATORY ORGANS. 1. HISTOLOGICAL STUDIES ON THE RESPIRATORY SYSTEM OF THE DOG. ***(Taikiosen no hai-kokyukikei ni oyobosu eikyo. 1. Kenhai kikanshikikei no soshiokigakuteki kenkyu). Text in Japanese. Nippon Eiseigaku Zasshi (Japan J. Hyg.), 26(1):151, April 1971. (Presented at the Japanese Society for Hygiene, Annual Meeting, 41st, Tokyo, Japan, April 3-4, 1971.)***

To study the effects of air pollution upon the respiratory organs, 186 dogs in Aichi Prefecture, Tokyo and Yokkaichi City were studied. The reactions and changes of the respiratory tract and the lung epithelium were examined. Slight proliferation of the epithelium and metaplasia were found in the throats of six cases. Dust was found on the tonsils in almost all the cases, although it was not clear whether it had been inhaled directly or not. In 14 cases distinct increases of fiber from foreign bodies were recognized, six of the showing changes in condition similar to anthracosilicosis. Proliferation of the mucus secretion cells in the trachea was found in 20 cases, and squamatization was found in four cases. Nineteen cases of squamatization were found in the divarication parts of the trachea. No examples of atypical lung proliferation were found. The relationship between the changes in condition and the degree of lung pollution was not as clear, but still could not be ignored.

11881 **APTIC NO. 29384**

Oya, Seiji and Noriaki Oya

ON REMOVAL OF NO GAS GENERATED IN MEDIUM AND SMALL SIZE CHEMICAL FACTORIES. ***(Chusho kagaku kojo yori hassei suru NO gasu no jokyo ni tsuite). Text in Japanese. Preprint, Safety Engineering Society of Japan, Tokyo, 4p., 1970. (Presented at Safety Engineering Society Research Presentation Meeting, 3rd, Tokyo, Japan, Dec. 9-10, 1970, Paper 24.)***

Nitrogen oxides discharged from small- and medium-size chemical factories, their toxicity properties, and removal methods are reported. The factories discharging NOx into the atmosphere include those engaged in the metal surface treatment process, metallic salt manufacturing, and the oxidation process. The NOx combines with hemoglobin in the blood to produce inert nitrogen oxide hemoglobin. When nitric oxide or nitrogen dioxide is inhaled, it affects the nerve system and paralyzes it, causing chronic bronchial catarrh. The relation between density and symptoms of NO2 infection cited from Henderson-Haggars study and Lehmarn-Hass study are shown. Properties of the nitrogen oxides, NO, N2O2, NO2, and N2O4 are also shown. Nitrogen oxide removal methods include oxidation-absorption, and two reduction methods. In the oxidation-absorption method, NO gas is oxidized by the oxygen present in the atmosphere and reacted with water to be reclaimed as nitric acc. When reacted with an alkali solution, it is reduced to nitrite and nitrate. When it takes too long to oxidize NO, the reduction method is more appropriate, NO is reacted with chlorine gas to produce nitrosyl chloride, which is further reacted with ammonia gas and reduced to nitrogen gas. In another reduction method, NO gas is mixed with hydrocarbon or hydrogen heated to 200 C, and treated with a catalyst (platinum or palladium), where it is reduced to nitrogen gas.

11882 *APTIC NO. 29392*

Kawakami, Masazumi

A STUDY OF THE EFFECTS OF CO ON THE NERVOUS FUNCTION. (CO no shinkei kino eno eikyo). Text in Japanese. Yokohama Univ. (Japan), Dept. of Physiology, 52p., March 1970. 141 refs.

Electrophysiological and biochemical examinations were carried out to observe the effects of carbon monoxide on the nervous system in rabbits. Thirty-five female and adult rabbits and 52 female adult rats were exposed to 1000 to 5000 ppm CO for 30 to 60 minutes. The effects of such exposures on for example the activities of the hypothalamus, the ciliary body, and the central gray matter were examined by electroencephalogram, multiple unit activities and induced electric potentials. Various changes were present at strictly limited sites; the reactions varied with the number of synapses at the contacting path of the nerve fibers. The hypothalamus was relatively resistant to CO exposure. A second experiment was carried out to investigate the effects of CO on the production of lipids and carbon dioxide from the fatty acids in the brain. Examination was made of brain slices of sheep and rabbits that had inhaled 50 and 100 ppm CO for 30 or 60 minutes; results suggested that CO2 and lipid production was inhibited. A second examination was carried out on brain slices of sheep and rabbits in which CO had chemically saturated the blood corpuscle solution and had physically entered intravenously in a normal saline solution. It appears that the production of lipids and CO2 from fatty acids in the brain is inhibited more strongly by the action of free CO than that of chemically combined CO.

11883 APTIC NO. 29399

Okutani, Hirotoshi and Shogo Shima

FINDINGS OF PNEUMOCONIOSIS IN INHABITANTS IN AREAS WHERE CERAMIC INDUSTRIES ARE LOCATED. *(Reisai yougyo chiki jumin no jinhai shoken). Text in Japanese. Japan Industrial Medical Society, Proc. Japan Ind. Med. Soc. Meet., 44th, Tokyo, Japan, 1971, p. 270-71. (April 3-4.)*

The incidence of pneumoconiosis was studied in inhabitants of Seto City (Aichi Prefecture), where numerous small ceramic plants are located. Medical examinations were conducted in five areas from 1965 and 1970. Indirect chest roentgenography was performed first and those who needed a closer examination received direct chest roentgenography, investigation of subjective symptoms, medical examination for tuberculosis, and tests required to diagnose pneumoconiosis. The total number of persons examined was 8457 (1850 men and 6607 women); 2% were under 20 years old, 77% were 20-49 years, and 21% over 50. A total of 486 required the more detailed examination. Among these, 255 persons were found to be suffering from either pneumoconiosis or pneumoconiotic tuberculosis. The percentage of findings of pneumoconiosis increased with age in both men and women; more than 50% were over 50 years of age. Fifty-two people among those with pneumoconiosis or pneumoconiotic tuberculosis were employed in the ceramic industry. In 69 persons among those who had neither special exposure to dust in the past nor histories of respiratory diseases, similar finding of pneumoconiosis were noticed on chest roentgenography. Judging from the above results, the problem of pneumoconiosis in areas supporting small ceramic industries requires appropriate measures not only from the standpoint of occupational sickness bu also in relation to the health inhabitants of the area.

11884 APTIC NO. 29415

Fukushima Prefectural Government (Japan)

INVESTIGATION OF EFFECT OF FLUORIDE ON HUMAN BODY. *(Fukkabutsu no jintai ni oyobosu eikyochosa). Text in Japanese. 66p., 1970.*

The effect of fluorides exhausted from aluminum smelters over a score of years was investigated on 35 to 64 year-old residents of either a polluted area (A) in Kitakata city. Fukushima prefecture, or a control area (B) in the suburbs of Kitakata city. One hundred and forty-three residents of A area and 135 residents of B area took medical advice. Geometric average values in the air were 1186.2 micrograms of fluoride in A area and 39.7 in B area. Tests were carried out on the existence of subjective symptoms. The medical history of fractures, mottled enamel, and swelling of the thyroid gland, bone radioscopy, electrocardiogram, lung ventilative function, the determinations of serum transaminase alkaline phosphatase, calcium, inorganic phosphorus, hematocrit value and the quantity of hemoglobin, urinary protein, urobirinogenen, sugar, and the quantity of fluorine in urine. These results were studied by area, sex, the number of years of residence, profession, and the toxicological effects. Excess intake of fluoride was not found to cause harm either in groups or in individuals. But the averages of the quantity of fluorine in urine were 0.88 ppm (male) and 0.70 ppm (female) in A area; both males and females were 0.47 ppm, in B area; this is the only point which differed for the two areas. X-ray investigation showed fair numbers of osteosclerosis, but these were not certified to have resulted from fluorine.

11885 APTIC NO. 29423

Kiyoura, Raisaku

PROBLEMS ON AIR POLLUTION IN JAPAN. *(Wagakuni no taiki osen no mondaiten). Text in Japanese. Jidosha Gijutsu (J. Soc. Automot. Engrs. Japan), 25(3):209-213, March 1971.*

When sulfuric acid gas emissions increased due to increased consumption of petroleum fuels, the problem of suspended dust was overlooked although it is emitted in great quantities from the burning of such fuels. The dust is 0.1-10 microns in diameter, and stays aloft in the atmosphere from a few hours to a few years. When heavy oil is burned 48-95% of the dust is less than 10 microns in size. About 62-80% of the dust from automobile exhaust gas is less than 2.0 microns. The 0.1-1.0 micron particles are likely to be inhaled into the lungs and retained there. The rate of deposition is reported to be about 53%. It is also reported that when dust is 200 micrograms/cu m for the 24 hour average, there is a high incidence of respiratory disease complaints the following two days. Even when sulfuric acid gas is about 0.01 ppm, if the dust concentration is also high, ther are many complaints from respiratory disease patients. When smog continued for four days in December 1962 in Osaka, the dust concentration averaged more than 1000 microgram/cu m a day, and there was and an increase in the mortality rate. The sulfuric acid gas during this period was lower than the period before of after. When there is a high concentration of unsoluble substances in the dust, the mortality rate from bronchitis increases. When measures are taken to decrease the concentration, the mortality rate decreases markedly.

11886 APTIC NO. 29430

Portheine, Friedrich

TO THE PROBLEM OF PASSIVE SMOKING: REMARKS TO THE ARTICLE BY H.-P. HARKE IN MUENCH. MED. WSCHR. *112(51):2328-2334, 1970. (Zum Problem des Passiv-Rauchens. Bemerkungen zu H.-P. Harke, Muench. med. Wschr., 112(51):2328-2334, 1970). Text in German. Muench. Med. Wochschr. (Munich), 113(18):707-709, 1971. 5 refs.*

Despite the inadequacies of the methods used by Hafke to analyze carbon monoxide emissions and concentrations, relatively high concentrations were measured. Other investigations measured maximum concentrations of 80 ppm CO in rooms where an excessive amount of cigarettes had been smoked. Measurements by the writer yielded 5 to 25 ppm CO in rooms where normal quantities of cigarettes had been smoked. In closed vehicles with the engine shutoff, the measured CO value from a normal amount of cigarette smoking was 166 ppm. A nonsmoking driver inhales just as much as the smoker in such cases. Measurments of CO in open air, at a height of 1.6 m aboveground and 20 cm off the road bank, in a busy Dusseldorf road revealed that, on a day of good dispersion conditions, the values corresponded closely to those in heavily smoked rooms. The fact is stressed that carbon monoxide concentrations of less than 50 ppm penetrate into the blood only after hours of exposure depending on lung ventilation.

11887 APTIC NO. 29453

Schaer, Meinrad

THE MAN AS BENEFICIARY AND THE PRAY OF TECHNICAL DEVELOPMENT. *(Der Mensch als Nutzniesser und Opfer der technischen Entwicklung). Text in German. Staedtehygiene (Uelzen/Hamburg), 22(4):77-81, 1971.*

With the random selection of high and low air pollution areas, a higher rate of chronic bronchitis is always found in highly polluted areas. In non-polluted areas, the rate of chronic bronchitis among male nonsmokers is 1% and among smoker 15%; in heavily polluted areas, it is 7% for non-smokers and 20% for smokers. As a study in Philadelphia shows, the morbidity rate is correlated with the wind direction, wind speed, smoke content, particulate concentration, and components of sulfur oxides. A negative correlation exists between air temperature and morbidity. However, none of these factors alone correlates with the morbidity. Sulfur dioxide affects the bronchi only in extremely high concentrations. Workers can inhale 5 ppm SO2 for eight hours per day without effect, while 1 ppm SO2 in the atmospheric air causes an increase of the bronchitis rate. A clear relationship also exists between the rate of lung cancer and the degree of air pollution. Carbon monoxide which is known as a dangerous toxic is present in the atmosphere in only small concentrations, even with heavy air pollution caused by smoke and automobile exhausts. Another disease which is strongly correlated with air pollution is asthmatic bronchitis. Some cities are known because of their high bronchial asthma morbidity, such as New Orleans asthma and Yokohama disease. The frequency of asthmatic attacks depends on the concentration of pollen and also on the content of sulfur oxides in the air. It is not influenced by pressure, temperature, or humidity of the air.

EFFECTS-PLANTS AND LIVESTOCK

11888 APTIC NO. 27352

Djuric, Dusan and Zarka Kerin

LEAD CONTAMINATION OF ENVIRONMENT IN MEZA VALLEY, YUGOSLAVIA: SOME CONSIDERATIONS ON LEAD CONTENT IN SOIL AND PLANTS. *Preprint, 10p., 1970. 2 refs. (Presented at the International Conference on Chemical Pollution and Human Ecology, Prague (Czechoslovakia), Oct. 1970.)*

As part of a broad ecological study of lead contamination, soil samples and underground parts of some vegetables were analyzed for lead by the dithizone method. Vegetables fell into three groups: those with a relatively high Pb content (over 30 mg/kg); those with a medium Pb content (over 10 mg/kg); and those with a low Pb content (under 5 mg/kg). Variations in Pb content in the same kind of vegetables represented variations in soil Pb content and absorption. Variations between different kinds of vegetables were due to differences in plant physiology and capacity of absorption, shape and size of root, and depth of root in soil. Lead content was higher in vegetables grown in summer and fall than for the same vegetables grown in spring. Lead absorption coefficients were calculated for underground parts of vegetables according to the relation between the Pb content of the plant and total Pb content of soil and according to the relation between the Pb content of the plant and the AL-soluble Pb in soil (AL is the ammonium lactate acetic acid mixture). The latter method gave much less dispersed coefficients, indicating that AL-soluble Pb represents much more authoritative data for determining absorption coefficients than total soil Pb.

11889 APTIC NO. 27388

Faller, N., K. Herwig, and H. Kuhn

ASSIMILATION OF SULFUR DIOXIDE (S3502) FROM THE AIR. I. INFLUENCE ON THE PLANT YIELD. *(Die aufnahme von Schwefeldioxyd (S3502) aus der Luft. I. Einfluss auf den Pflanzlichen ertrag). Plant Soil, vol. 33:177-191, 1970. 2 refs. Translated from German. APTIC Tr. 1089.*

Sunflower, corn, tobacco, and radish plants were exposed to 0-1.5 mg sulfur dioxide/cu m air for 9-20 days in special vegetation chambers. Corn and sunflower reacted with 0.5 or 1.0 mg SO2/cu m air to give an optimal yield, and a rise in yield was established for radish and tobacco up to 1.0 or 1.5 mg SO2/cu m air. Under the experimental conditions, the SO2 assimilated from the air represented the predominant source of sulfur which, in general, makes possible normal plant growth. The results demonstrate that the sulfur supply from the air is of special importance for plants with insufficient nutrition in contact with plant roots. (Author summary modified)

11890 APTIC NO. 27527

Heck, Walter W.

THE ROLE AND ACTIVITIES OF THE AGRICULTURAL BRANCH OF THE NATIONAL AIR POLLUTION CONTROL ADMINISTRATION. *Preprint, Air Pollution Control Assoc., Toronto, Ontario Section, Air Pollution Control Assoc., Pittsburgh, Pa., TR-7 Agricultural Committee and Ontario Dept. of Energy and Resources Management, Toronto, Air Management Branch, 6p., 1970. (Presented at the Impact of Air Pollution on Vegetation Conference, Toronto, Ontario, April 7-9, 1970.)*

The Agricultural Branch of the National Air Pollution Control Administration has a dual role in serving both the Department of Agriculture and the Department of Health, Education and Welfare. The Branch was started in 1956 and has three main objectives: the maintenance of liaison between the two departments on agricultural aspects of air pollution; the carrying out of research studies on the effects of air pollutants on vegetation; and the provision of consultative services to all levels of government, to industry, and to others desiring technical advice on the agricultural effects of air pollution. In the past decade, the activities of the branch increased greatly as many reorganizations occurred in the two departments. The educational role of the branc has expanded with an increasing number of states requesting trainin programs for their personnel in the detection and assessment of air pollution injury to vegetation. The research studies on air pollution effects on vegetation provide data for the formulation of air quality criteria and standards, and aid in the estimate of the economic impact of air pollution on agriculture. (Author abstract modified)

11891 APTIC NO. 27580

Dreisinger, Bruce R. and Peter C. McGovern

MONITORING ATMOSPHERIC SULPHUR DIOXIDE AND CORRELATING ITS EFFECTS ON CROPS AND FORESTS IN THE SUDBURY AREA. *Preprint, Air Pollution Control Assoc., Toronto, Ontario Section Air Pollution Control Assoc., Pittsburgh, Pa. TR-7 Agricultural Committee, and Ontario Dept. of Energy and Resources Management, Toronto, Air Management Branch, 23p., 1970. (Presented at the Impact of Air Pollution on Vegetation Conference, Toronto, Ontario, April 7-9, 1970.)*

Vegetation has been and continues to be injured by emissions of sulfur dioxide from mining companies in the Sudbury area. Between May and October, 1964 through 1968, approximately 200,000 hrs of air sampling were carried out at 10 Thomas autometer sites at distances of five to 40 miles from Sudbury. Sulfur dioxide was recorded for 13% of the total time the recorders were operating, and half-hr concentrations reached a maximum of 2.86 ppm 16 miles from Sudbury. During the five-yr period, 3365 daytime fumigations were recorded at the 10 stations, 247 of which reached or exceeded levels known to be potentially injurious to vegetation. Approximately 2100 sq miles were subjected to a least one potentially injurious fumigation and about 50 sq miles to 20 or more potentially injurious fumigations. One of the fumigations reached levels almost five times those required to cause injury. Injury was observed in vegetation near recorder stations following 62 fumigations. Buckwheat and trembling aspen were considered to be two of the most sensitive species growing in the Sudbury area. To minimize SO2 injury, ground-level concentrations and duration in the Sudbury area should never exceed 0.70 ppm for one hour; 0.40 ppm for two hrs; 0.26 ppm for four hrs; or 0.18 ppm for 8 hrs. (Author abstract modified)

11892 APTIC NO. 27785

Cormis, Louis de

EFFECT OF INDUSTRIAL AIR POLLUTION ON VEGETATION. *(Effet sur les vegetaux de la pollution de l'air d'origine industrielle). Text in French. Ann. Mines (Paris), no. 11:15-20, Nov. 1970.*

The two major pollutants of plants are sulfur dioxide and fluorine compounds. SO2 causes necrosis of leaves but the vegetation resumes after the pollution wave has subsided. The killing of tree or of shrubs has never been observed. Under conditions of maximal photosynthesis and of high relative humidity, the noxious effect of SO2 is at its peak. At a subnecrotic level of SO2, plants absorb SO2, then re-emit part of it as SO2, another part as hydroge sulfide, and absorb a third part which appears in sulfates, proteins, and in sulfonated aminoacids. The absorption of SO2 and its reduction by the plant is tied to the photosynthetic activity of the plant. Fluorine compounds in the atmosphere cause leaf necrosis at 10 to 1000 times lower levels than SO2. In contrast to SO2, necrosis develops slowly from the periphery to the center of the leaves. Fluorine ions do not participate in plant metabolism at any level. Since some highly necrotic leaves exposed to fluorine contain only traces of F (20 to 40 ppm) while leaves of other plants contain up to 1000 ppm F without signs of necrosis, analytical findings are of no use in the determination of the effec of fluorine on vegetation. A high level of fluorine in the atmosphere will kill plants. Effects of pollutants on vegetation cannot be predicted because they depend, in each case, on crop, locality and growth season.

11893 APTIC NO. 28053

Karpen, Daniel N.

OZONE AND SULFUR DIOXIDE SYNERGISM: FOLIAR INJURY TO A PONDEROSA PINE GEOGRAPHIC RACE PLANTATION IN THE PUGET SOUND REGION. *Plant Disease Reptr., 54(11):945-948, Nov. 1970. 11 refs.*

Chlorotic foliar spotting similar to the damage observed on ponderosa pine in the San Bernardino National Forest near Los Angeles has appeared in a stand of ponderosa pine near LaGrande, Washington, about 6.5 miles south of Seattle. Data are presented on the relative susceptibility to air pollution damage of each of the 10 geographic races represented in the stand. Based on characteristics such as needle retention, color, length and branch mortality, the data may have future importance in the selection of pollution-resistant ponderosas for reforestation purposes. In the Seattle area, concentrations of ozone and sulfur alone appear to be lower than that required to produce the chlorosis observed. It is hypothesized tha the injury may be due to synergistic effects resulting from the interaction of sulfur dioxide with naturally occurring ozone.

11894 APTIC NO. 28474

Zuber, R., E. Bovay, M. Roulet, and W. Tschannen

ATMOSPHERIC POLLUTION AND ITS EFFECT ON THE PLANT. *(Die Verunreinigung der Atmosphaere und ihr Einfluss auf die Pflanze). Text in German. Schweizerische Gaertnerzeitung (Zurich), 73(19): 233-236, May 1970.*

Sulfur dioxide penetrates into the interior of leaves more readily at higher temperatures, under bright light, and at high humidity than in cold and dry weather and in darkness. The plant has a defensive mechanism in that it oxidizes the sulfite ion to a sulfate ion 30 times less toxic. Fluorine emissions from aluminum works, glass works, brick factories, ceramic factories, phosphate fertilizer plants, and from the manufacture of hydrofluoric acid can be controlled by the Harding-Desbaumes device which absorbs not only gaseous fluorine compounds but partly also solid fluorine compounds in dust and in aerosol. Fluorine is absorbed by plants principally through leaves, and only to a small degree through root from the soil. Its distribution in the plant is uneven, with content high in roots, leaves, and stems. Fluorine compounds cause plasmolysis of the cell content and thus the death of cells manifested by necrotic plant tissue. Chlorine and hydrochloric acid, which cause burns in plants, now contaminate the atmosphere only rarely; ammonia has a similar effect. Dust from cement factories and metallic oxide dust cause plant necrosis. Of automobile exhaust pollutants, saturated hydrocarbons, nitrogen oxides and organic acids are less phytotoxic, while ozone, nitro-derivatives, and peroxyacetyl nitrate are more so. Lead emissions do not seem to cause severe damage to plants even at high levels but are dangerous indirectly to animals and humans.

11895 APTIC NO. 28802

Rohmeder, Ernest and Alexander von Schonborn

THE BREEDING OF SPRUCE WITH INCREASED RESISTANCE TO EXHAUST GAS. *International Union of Forest Research Organizations, Proc. Congr. Intern. Union Forest Research Organizations, 14th, Munich (West Germany), 1967, 5(Sect. 24):556-566. 8 refs. Translated from German, 12p.*

Thirty-six spruce of average age were selected from stands severely damaged by smoke in West Germany; the chosen trees remained somewhat healthy and productive in spite of severe exposure to smoke. About 7000 shoots were obtained by means of grafts from the selected trees. In greenhouse fumigation experiments with exactly measured concentrations of sulfur dioxide and hydrogen fluoride, the grafts displayed considerably more resistance than grafts whose shoots stemmed from spruce living more than 100 years in the high mountains. It was demonstrated that the characteristic of heightened resistance to exhaust gas is based in the genetic spectrum. The resistant grafts were even less damaged by SO2 and HF, and by fumigation mixtures, than were other kinds of conifers and deciduous trees. Only the oak tolerated even higher SO2 and HF concentrations than did the resistant grafts. The greenhouse fumigation experiments clarified which environmental factors influence the smoke resistance of forest trees. It was found that the higher the relative humidity, the higher the light intensity, or the higher the assimilation intensity, the greater the damage to forest trees. During the winter, forest trees contain higher concentrations of components such as SO2 than in the summer. Optimally nourished plants endure higher concentrations than do plants cared for with insufficient nutrients. (Author summary modified)

11896 APTIC NO. 28849

Zimmerman, P. W. and William Crocker

PLANT INJURY CAUSED BY VAPORS OF MERCURY AND COMPOUNDS OF MERCURY. *Contrib. Boyce Thompson Inst., 6(1):167-187, Jan.-March 1934. 6 refs.*

Experiments were performed to determine the effect of vapors of mercury and its compounds on growing plants when exposed under various conditions. Treating one bed of soil in a rose house with bichloride of mercury injured flowers of Briarcliff variety over the entire range, showing that the plants were attacked by some inpurity in the air. Flower buds of roses in all stages of development were affected by the vapors emanating from soil treated with bichloride. Peduncles of very young buds turned yellowish and then black; half mature buds turned brown, and the corollas abscissed from the receptable without opening; the older buds continued to unfold but the petals lacked the pink color characteristic of Briarcliff variety and brown patches finally developed; stamens also were injured, turning nearly black in half mature buds. Leaves of rose plants confined in glass cases with treated soil were injured as well as flower buds. Plants of 65 different genera were found susceptible to injury from vapors emanating from soil or tankage moistened with bichloride solution. Ten types were found to be comparatively resistant. The injury to plants from vapors from metallic mercury was similar to that caused by vapors emanating from soil treated with bichloride. Thirteen other compounds of mercury affected plants as reported for bichloride; of these six were organic, and seven inorganic. The extent of the injury and the rate at which metallic mercury injured plants varied with the concentration of the vapor in the air and this in turn varied with the temperature. Vapors from soil treated with mercury compounds injured plants more quickly at high than low temperature. In general, the amount of injury at a given temperature could be correlated with mercury vapor pressure at the same temperature. Metallic mercury vapor was detected in the air surrounding soil treated with the mercury compounds, indicating reduction to the metallic state. Mercury was recovered from leaves of plants confined in glass cases where a small amount of soil had been moistened with a solution of bichloride. (Author summary)

11897 APTIC NO. 28888

Thomas, Moyer D.

THE INVISIBLE INJURY THEORY OF PLANT DAMAGE. *J. Air Pollution Control Assoc., 5(4):205-208, Feb. 1956. 8 refs. (Presented at the Air Pollution Control Association, Annual Meeting, 48th, Detroit, Mich., May 22-26, 1955.)*

A summary is presented of the present state of knowledge of sulfur dioxide, hydrogen fluoride, coal smoke, and smog in relation to invisible plant injury. The latter is defined as interference with growth, photosynthesis, respiration, reproduction, or enzymatic function, or demonstratable increase in susceptibility to disease. The evidence relating to physiological activity seems definite that invisible injury due to the reducing conditions that characterize sulfur dioxide fumigations is a second-order effect at the most. No observations have been recorded to suggest that the gas makes plants more susceptible to disease. The oxidizing conditions in smog seem to be more effective in causing invisible injury, possibly because the normal reductive processes in the leaf are less intensive than the oxidative process. Toxic fluoride ions have to be disposed of by rather slow mechanical means like translocation and volatilization and, therefore, permit some invisible injury when threshold concentrations are exceeded. Toxic organic compounds in smoke are more difficult to characterize, because their identity has not been definitely established. Presumably they represent a wide spectrum of compounds which would have to be inactivated primarily by chemical means. They might, therefore, interfere appreciably with the normal reactions in the leaf and cause some invisible injury. (Author summary modified)

11898 APTIC NO. 28899

Wander, I. W.

EFFECTS OF POLLUTANTS ON VEGETATION (WITH SPECIAL REFERENCE TO THE EFFECT OF FLUORINE ON CITRUS). *Fla. Eng. Ind. Expt. Sta. Bull., Eng. Progr. Univ. Florida Bull. Ser., no. 10(9):14-16, Sept. 1956. 20 refs.*

Following the construction of several triple-superphosphate manufacturing plants in Polk County, Florida, a unique chlorotic pattern developed on citrus leaves, particularly grapefruit. The condition differed from known chloroses resulting from nutritional deficiencies or toxicities and was eventually traced to the fluorine being released by the phosphate plants. The fluorine content in the chlorotic leaves ranged from 370 ppm to a low of 48 ppm. These findings are noted to contradict a California study which reported no instances of chlorosis in citrus leaves that were found to contain up to 211 ppm fluorine. The fact that chlorosis develops in Florida may be due to the higher humidity under which the leaves mature.

11899 APTIC NO. 28900

McCornack, A. A., L. C. Cochran, Harley English, and C. L. Hemstree

A BLACK TIP CONDITION ON PEACH FRUITS IN CALIFORNIA. *Plant Disease Reptr., 36(3):99-100, March 15, 1952. 1 ref.*

An unusual dead tip condition was observed in peach fruits in the Cucamonga area of California in 1950 and 1951. The symptoms on affected fruit consisted of black, generally circular, sunken areas at the blossom ends. The summation of available evidence indicates that the black tip is caused not by an infectious agent, but by some physical or chemical injury. The affected area lies within 4 to 12 miles of the Fontana steel plant, which has grown steadily in size and operation since its construction in World War II.

11900 APTIC NO. 28948

Pelz, Eberhart, Horst Beyer, and Gerhard Bleyer

THE DIAGNOSIS AND EFFECTS OF SMOKE DAMAGE IN THE VICINITY OF A LEAD SMELTERY. *(Untersuchungen zur Diagnose und Wirkung von Rauchschadden in der Umgebung einer Bleihuette). Text in German. Wiss. Z. Tech. Univ. Dresden, 12(1):209-216, 1963. 10 refs.*

The effects of extreme smoke emission from a lead smelting plant situated 340 m above sea level with a median yearly temperature of 7.7 C and an annual precipitation of 868 mm on the surrounding woods were studied by analyzing the air using the Liesegang method, by conimetric determination of dust emission, by soil analysis for the presence of arsenic, and by Haertel's turbidity test. A positive, statistically significant correlation coefficient (0.83) was found to exist between the number of dust particles per liter of air and the median sulfur content of air samples from nine locations. The damage to vegetation was greatest where continuous SO2 emission was compounded by considerable As soil concentrations. Deciduous trees were generally more resistant than conifers. Birches were most resistant of all tree varieties. Severe damage was confined to a distance of 1 km from the source.

11901 APTIC NO. 29010

Mohamed, Aly H.

CHROMOSOMAL CHANGES IN MAIZE INDUCED BY HYDROGEN FLUORIDE GAS. *Can. J. Genet. Cytol. (Ottawa), 12(3):614-620, Sept. 1970. 18 refs.*

Twelve corn plants were placed in growth chambers and fumigated for four to ten days with about 3 micrograms/cu m of hydrogen fluoride (HF). Following treatment, the plants showed no visible symptoms of fluoride injury. However, microsporocyte smears from the plants revealed chromosomal aberrations that included asynaptic regions, translocations, inversions, and bridge plus fragments or fragments by themselves. These abnormalities are considered due to the physiological effect of HF causing chromosome to become sticky and/or to the occurrence of chromatid breakage followed by reunion to form structural changes. These findings indicate that HF is a mutagenic agent. (Author abstract modified)

11902 APTIC NO. 29075

York, E. T., Jr.

ECOLOGY, THE ENVIRONMENT AND MAN--A PERSPECTIVE. *Citrus Ind., 51(11):4-7, Nov. 1970. (Presented at the Citrus Growers Institute, Annual, 40th, Camp McQuarrie, Fla., Aug. 19, 1970.)*

The validity of the 'balance of nature' concept is questioned on the grounds that man is entitled to alter the balance of nature in his favor. For example, man has found it desirable, if not essential, to control insect pests that compete with him or otherwise limit his means of survival. In this connection, the DDT controversy is analyzed in an attempt to put the overall question of man in relation to his environment in better perspective. The scientific basis for the concern over DDT was a laboratory study indicating that DDT in sea water could inhibit photosynthetic activity in marine algae. DDT concentraions in the ocean could never reach the experimental levels where photosynthesis was affected. There is also a lack of evidence to support the alleged disastrous effects of DDT usage on fish, birds, and other wildlife. Moreover, DDT is not injurious to humans when used in accordance with prescribed procedures. The solution to ecological and environmental problems requires not a moratorium on the development of technology but the creation of ways of recycling and reusing resources, many of which end up as waste products.

11903 APTIC NO. 29135

Krippelova, Terezia

PUCINELLIO-CHENOPODIETUM GLAUCI ASSOC. NOVA. *(Pucinellio- chenopodietum glauci assoc. nova). Text in German. Environ. Pollut., 1(3):185-189, Jan. 1971. 11 refs.*

The association Puccinellio-Chemopodietum glauci represents a hitherto never before described new plant community of the Polygonion avicularis Br.-Bl. 1931 association which in strongly polluted regions replaces the Plantagino-Lolietum association from which it develops by trampling. The observation comes from Kosice in eastern Slovakia where the soil contains high concentrations of magnesium salts from atmospheric effluents of the magnesite works in Tohanovce. Plant analysis disclosed that Puccinellio-Chenopodietum glauci was a phytocenologically circumscribed plant association which, in spite of continuous exposure to the magnesite work effluents, maintains its composition. This association is an indicator of the polluted atmosphere of Kosice and evidence of the incorrect choice of the site for the magnesite plant.

11904 APTIC NO. 29147

Byrne, A. R. and L. Kosta

STUDIES ON THE DISTRIBUTION AND UPTAKE OF MERCURY IN THE AREA OF THE MERCURY MINE AT IDRIJA, SLOVENIA (YUGOSLAVIA). *Vestn. Sloven. Kem. Drustva, 17(1/4):5-11, 1970. 5 refs.*

Results are presented of a preliminary investigation of the mercury content of environmental samples, primarily of various water, soil, and plant samples, in the neighborhood of the mercury mine at Idrija, Yugoslavia. The measurement technique was activation analysis using a volatilization method for mercury separation. Results show a wide range from apparently normal background (0.005-0.1 ppm) to very high levels (10-100 ppm). The highest values are mainly due to aerial contamination from the mine flue gases. More importantly, the results show the ability of vegetation to accumulate mercury during growth. (Author abstract)

11905 APTIC NO. 29254

Bertitz, Siegfried and Michael Vogl

ON THE TRANSPIRATION OF CONIFER NEEDLES WITH DIFFERING EXPOSURES TO SO2. *(Zur Transpiration von Koniferennadeln bei Untersohiedlieher SO2 Einwirkung). Arch. Forstwes, vol. 11:663-? 1967. 3 refs. Translated from German.*

Gassing of conifer needles from smoke-damaged trees with high sulfur dioxide concentrations (10-200 ppm) produced a decrease in assimilation and an increase in transpiration that was followed by a subsequent decrease as cell destruction in assimilation organs progressed. Gassing with low SO2 concentrations produced two completely different reactions. In one case, a clear decrease in assimilation was observed following exposure of needles to 1.7 ppm SO2, but further gassing with a carbon dioxide balance was required to increase transpiration. In another case, 0.85 ppm SO2 produced a simultaneous lessening of assimilation and transpiration. In field measurements, a decrease in transpiration was observed only where a decline in assimilation was already apparent. These results are compared with earlier, contradictory studies.

11906 APTIC NO. 29277

DAMAGE CAUSED BY FLUORINE NEAR RHEINFELDEN AND MOEHLIN. *(Fluorschaeden bei Rheinfelden und Moehlin). Text in German. Leben und Umwelt (Aarau), 12(3):69-71, Dec. 1955.*

In 1952 the widespread dying of bees was for the first time attributed to the fluorine in flue gases of the aluminum plant in Rheinfelden-Baden. The bees contained from 5 to 112 mg fluorine in 100 g dry substance while the norm is 0 to 4 mg. In 1953 damage was noted for the first time in vegetation in the form of marbleizing and peripheral damage to leaves. Leaves curled up and assumed a spoon-like shape. More severe damage was manifested by necrosis proceeding from the leaf tip along the rims. Conifers exhibited similar symptoms and some complete defoliation occurred. Especially afflicted were cultures of clover, all cereal crops, and various grasses. The harvest was reduced by 50%. In 1955 cows were afflicted by a peculiar disease; they began to tremble, lost weight, and manifested pain in legs and joints. They often broke ribs and other bones. The fluorine content in cow bones was 6-10 times higher than the norm. These animals, suffering from fluorosis, either recovered spontaneously or died; administration of vitamins did not have any effect. Domestic animals not fed with green fodder or hay were unaffected, as were humans. The milk and meat of the diseased animals did not contain excessive levels of fluorine. Elevated levels of fluorine were detected in vegetation to a distance of 6 km from the factory.

11907 APTIC NO. 29370

Dunskii, V. F. and K. A. Krishtof

DEPOSITION OF UNIPOLARLY CHARGED AEROSOLS ON CONDUCTORS AND DIELECTRICS. *Colloid J. (USSR) (English translation from Russian of: Kolloidn. Zh.), 32(5):578-583, Sept.-Oct. 1970. 1 ref*

An approximate theory of deposition of unipolarly charged aerosols in an electrostatic field on grounded and insulated bodies is developed. According to this theory, elecrfification intensifies and equalizes particle deposition on grounded conductors and virtually prevents deposition on insulated bodies. The theory was qualitatively confirmed by experiments. It was shown experimentally that young tomato plants behave like grounded conductors with respect to deposition of aerosols. The theory, which has implications for pesticide spraying and the painting of industrial products, will be further tested on other species of young plants. (Author abstract modified)

11908 APTIC NO. 29443

Nakagawa, Yoshihiro, Shozo Matsuda, Masamichi Hara, Tahachiro Koyama, and Nobutaka Takada

CASUALTIES IN PLANTS BY FLUORIDES IN EXHAUSTIVE GAS OF GLAZED TILE MANUFACTURING FACTORY. *(Yuyakugawara seizo kojo haigasuchu fukkabutsu ni yoru shokubutsu higai ni tsuite). Text in Japanese. Hyogo-ken Eisei Kenkyusho Kenkyu Hokoku (Rept. Environ. Sci. Inst. Hyogo Prefect.), no. 2:11-17, March 1971. 9 refs.*

The cause of crop damage around a glazed tile manufacturing factory was determined by a survey of raw materials, fuel exhaust gas, environmental air, and damaged plants. During the period from May to August 1969, two ceramics with two tunnel kilns (the amount of exhaust gas per one tunnel kiln was 2700 2800 N cu m/hr) were tested. The change in fluorides in the tiles by calcination was measured and 296 306 ppm of the fluorides were found before the calcination and 208 214 ppm after it. The volatilizing amount of fluorides in the exhaust gas was about 45 ppm. On the other hand, the amount of fluorides contained in the exhaust gas in the fire flue was 1.7 4.4 ppm. This was perhaps caused by the condensatio and adhesion of produced fluorides in the remaining heat kiln and i a fire flue. According to the JIS (Japanese Industrial Standard) K 0105 analysis method, the amount of fluorides in the exhaust gas was 0.020 0.043 ppm. Also, according to the Lime Treated Filter Paper method by Miller, the highest value in the place where the damage was the most distinctive was 258 micrograms F(-)/100 sq cm/3 days. The damaged plants included carnations, moist-land rice plants and onions. When the fluorides in the leaves were compared with those in healthy leaves, they showed: in carnations, where the amount of fluorides was the highest, the value of the damaged leaves was 52.3 ppm and that of the control leaves was 22.4 ppm; fo the onions, the result was 42.1 ppm in the control leaves and 52.3 ppm for damaged leaves; for bamboo grass growing near the kilns, the amount of the fluorides was more than 12 times that of control leaves. Also, research was made on copper and sulfur oxides, and the obtained value was small in both cases. So the damage to crops is considered to be due to the fluorides.

EFFECTS-MATERIALS

11909 APTIC NO. 28813

Moran, J. J., E. N. Skinner, and F. L. LaQue

MATERIALS FOR ANTI-SMOG DEVICES. *ASM (Am. Soc. Metals) Metals Eng. Quart., 2(2):35-41, May 1962. 17 refs. (Presented at the National Metal Congress, Detroit, Mich., Oct. 23, 1961.)*

The salient features of the major types of anti-smog devices under development are reviewed, as are the corrosion phenomena at elevated and ambient temperatures likely to influence the performance of alloys of construction. Pertaining to the emissions of hydrocarbons and carbon monoxide in automobile exhaust gases, virtually all control devices fall within either of two categories: the direct flame afterburner and the catalytic convertor. Comparison is made of the behavior at elevated temperatures of a number of representative engineering alloys exposed to the significant products of combustion of automotive fuels; in particular, consideration is given to the effects of oxidation, sulfidation, unburned hydrocarbons, halides, and lead compounds. Of the nearly 150 chemical compounds found in automobile exhausts, about 140 have been identified as hydrocarbons that, as a class, may cause carburization of steel alloy parts that attain a sufficient high temperature. Severe coking and the corrosivity of lead oxide are mentioned. The common use of chloride salts for ice and snow removal introduces another hazard if the alloys used for antismog devices are susceptible to stress corrosion cracking from chlorides. Many of the ferritic and austenitic stainless steels are susceptible to sigma formation, which is a source of embrittlement, at somewhat higher temperatures. Thermal expansivity has an important bearing on the selectivity of alloys for elevated temperature service. (Author abstract modified)

11910 APTIC NO. 28822

Brandt, S. M. and L. H. Adam

ATMOSPHERIC EXPOSURE OF LIGHT METALS. *In: Metal Corrosion in the Atmosphere. Am. Soc. Testing Mater. Spec. Tech. Publ., no. 435:95-128, 1968. 12 refs. (Presented at the American Society for Testing and Materials, 70th Annual Meeting, Boston, Mass., June 25-30, 1967.)*

A ten-year atmospheric corrosion test program for alumium and magnesium base alloys is summarized. The program included fourteen cast, nine wrought, and three clad aluminum alloys and five cast an four wrought magnesium alloys. The specimens, exposed at five outdoor exposure sites in the United States, were tested after exposure periods of six months, one, three, five, and ten years. Sites were selected to include rural, industrial, and marine type atmospheres. Tensile strength of the exposed specimen was compared to that of the control specimen which was stored in a sealed container. The per cent changes in tensile strength for the exposed specimens compared to the control specimens are included in the data presented.

11911 APTIC NO. 28823

Spatig, D. O. and W. H. Ailor, Jr.

COMPUTERIZED LONG-TERM CORROSION DATA. *In: Metal Corrosion in the Atmosphere. Am. Soc. Testing Mater. Spec. Tech. Publ., no. 435:43-60, 1968. 2 refs. (Presented at the American Society for Testing and Materials, 70th Annual Meeting, Boston, Mass., June 25-30, 1967.)*

A program has been devised which permits computer handling of all data derived from 20-year atmospheric and marine programs. This program makes feasible the routine handling of thousands of test specimens and calculations in an accurate but rapid method. Tape records from punched cards include exposure location, duration of test, mechanical properties, density, alloy type, and panel dimensions for both control and exposed specimens. These tape records are processed on an IBM 1410 computer to calculate the effects of aging and exposure. The final machine-printed report gives the corrosion rate in mdd (milligrams per square decimeter pe day) and mpy (mils per year), along with percent changes in tensile yield, and elongation values due to corrosion for individual specimens, and also calculates average values of these properties by alloy and exposure site. (Author abstract)

11912 APTIC NO. 28893

Ailor, W. H. Jr.

PERFORMANCE OF ALUMINUM ALLOYS AT OTHER TEST SITES. *Am. Soc. Testing Mater. Spec. Tech. Publ., no. 435:285-307, 1968. (Presented at the American Society for Testing and Materials, Annual Meeting, 70th, Boston, Mass., June 25-30, 1967.)*

Aluminum alloys were exposed to the atmosphere for seven years at Corpus Christi, Tex.; Richmond, Va.; McCook, Ill.; and Kure Beach, N. C. A decrease in the corrosion rate, as determined by weight loss, was evident for all sheet alloys after about the second exposure year. Likewise, the depth of pitting decreased with time; very slight increases in depth were noted between the second and seventh years in most cases. The McCook site was indicated to be the most severe, followed by the Richmond location, the Corpus Christi exposure, and Kure Beach in order of decreasing severity. The value of cladding basic alloys such as 3003 and 6061 was again demonstrated. Other than the 2024 aluminum-copper alloy which showed intergranular corrosion for some hard tempers at the most severe sites, all alloys showed pitting corrosion to some extent. Maximum pit depths included 14.7 mils for the 2024-T36 alloy, 10.0 mils for the 5154-H34 aluminum-magnesium alloy, 5.2 mils for the aluminum-magnesium silicide alloy 6061-T6, and 6.3 mils for the high-purity aluminum sheet. A corrosion rate of 0.175 milligrams per square decimeter per day for 2024-T36 alloy at McCook was the highest found. High purity aluminum showed rates from a low of 0.004 mdd at Kure Beach to 0.044 mdd at McCook. (Author abstract)

11913 APTIC NO. 28941

Black, H. L. and L. Lherbier

A STATISTICAL EVALUATION OF ATMOSPHERIC, IN-SERVICE, AND ACCELERATE CORROSION OF STAINLESS STEEL AUTOMOTIVE TRIM MATERIAL. *In: Metal Corrosion in the Atmosphere. Am. Soc. Testing Mater. Spec. Tech. Publ., no. 435:3-32, 1968. 4 refs. (Presented at the American Society for Testing and Materials, 70th Annual Meeting, Boston, Mass., June 25-30, 1967.)*

Stainless steel panels with various surface finishes were exposed to winter salt and ash conditions on trucks and automobiles, salt atmosphere, industrial atmosphere, and rural atmosphere for periods of one to four years. They were also evaluated by six accelerated tests either presently used by, or proposed by, the automobile industry. Comparisons of the average results of the multiple specimens were made in an attempt to determine the relative superiority among the grades of stainless steel and among the surface finishes in each exposure environment. Statistical correlation coefficients were calculated to determine the degree of corrosion resistance correlation among the sites and to determine the correlation between 'in-service' corrosion and the accelerated tests. No clear superiority of any grade in all environments could be determined. With the exception of chromium flash plating, no surface finish tested was significantly superior to any other. The automobile and truck exposures showed that the varying weather conditions from one winter to another could cause unpredictable, conflicting results. The correlation between corrosion resistance and temperature, snow-fall, and de-icing agents was not clear. The statistical correlation analysis conducted showed that very limited or no correlation exists between in-service corrosion and accelerated tests. Even among the tests, the correlation was poor or not existent, and none of the accelerated tests evaluated can be expected to predict stainless steel corrosion performance in service. (Author abstract)

11914 APTIC NO. 28949

Mannweiler, G. B.

CORROSION TEST RESULTS ON FIFTEEN FERROUS METALS AFTER SEVEN-YEARS ATMOSPHERIC EXPOSURE. *Am. Soc. Testing Mater. Spec. Tech. Publ., no. 435:211-222, 1968. 4 refs. (Presented at the American Society for Testing and Materials, Annual Meeting, 70th, Boston, June 25-30, 1967.)*

Findings are reported on ferrous corrosion specimens that had been exposed for seven years to the atmosphere of five different test sites, which included rural, marine, and industrial environments. The materials employed were ten malleable and pearlitic malleable irons, two ductile irons, and three rolled steels. Previous removals of companion sets of specimens had been made after one and three-year exposures, and a final set is scheduled for removal in 1970 after a twelve-year exposure. The rate of atmospheric attack continued to fall off with time, amounting to 53 and 60.5% of the first year rate, respectively, for all castings and for all steels after the third year, and 33.5 and 41% after the seventh year. Of all 15 materials, the unalloyed steel was most strongly attacked, and the copper-alloyed steel about 43% less. With the exception of the two 32510 irons, all other malleable irons, ductile irons, and the copper chromium-nickel alloy steel fell within a common average weight loss band--5.5 to 11 g/sq dm. Copper additions of about one-half percent to malleable iron improved the resistance to atmospheric attack by an average of about 18%; copper in rolled steel provided even more significantly improved resistance. Machining the malleable irons tended to result in 1/4 to 1/3 higher corrosion; machining the ductile irons had the reverse effects, presumably through removal of the deleterious cast surface. The marine test site at Kure Beach, N. C., consistently proved to be the harshest test site and the rural site at State College, Pa. the mildest. (Author abstract modified)

11915 APTIC NO. 28950

Mattsson, E. and S. Lindgren

HARD-ROLLED ALUMINUM ALLOYS. *Am. Soc. Testing Mater. Spec. Tech. Publ., no. 435:240-256, 1968. 7 refs. (Presented at the American Society for Testing and Materials, Annual Meeting, 70th, Boston, Mass., June 25-30, 1967.)*

In 1955, exposure tests were begun with the following architectural aluminum alloys in hard-rolled condition: high-purity aluminum, commercial purity aluminum (with and without 0.14% copper), aluminum-manganese 1.2 (with and without 0.14% copper), aluminum-manganese 0.65, aluminum-manganese 2.5, aluminum-clad (with core of aluminum-manganese 1.2 and cladding of aluminum-zinc 1). Panels of the alloys were exposed on five sites in Sweden with rural, marine, urban-marine, and industrial atmospheres. After one-, three-, six-, and ten-year exposures, specimens were taken in and examined with respect to pitting, layer corrosion, and change in mechanical properties. Of the hard-rolled alloys tested, the aluminum-manganese type seems well suited for architectural purposes. There is no risk of blistering, and the pitting corrosion resistance is as good as for unalloyed aluminum. With hard-rolled, unalloyed aluminum of commercial purity and aluminum-manganese 1.2, both without copper, the risk of blistering cannot be disregarded, at least not in the marine atmosphere. Here layer corrosion blisters were formed on the alloys mentioned in most cases already during the first year of exposure; after the initial period, however, they generally developed very slowly. One way to overcome the susceptibility to blistering apparently is to add about 0.1 to 0.2% copper. Another remedy might be to use alloys in half-hard condition. The aluminum-clad surface developed a rather rough appearance. (Author abstract modified)

11916 APTIC NO. 29005

Thelamon-Meynard, Claude

STUDY OF NEW ANTIOZONES. *(Etude de nouveaux antiozones). Text in French. Rev. Gen. Caout. Plast., 47(5):597-604, May 1970. 15 refs.*

The volatility and protective effectiveness of various modern antiozones for butadienstryene copolymer mixtures was determined experimentally. Included in the tests were representative compounds of the three p-phenylenediamine categories of derivatives, of dialkyl-para-phenylenediamines, of alkyl-aryl-paraphenylenediamines and of diaryl-para- phenylenediamines. In static tests (on strips of synthetic rubber), waxes used by themselves accorded good protection. Waxes used in conjunction with antiozones facilitate the migration of the latter to the surface and thus enhance the protective effect especially under conditions of elongation (stretching) of the rubber strips. Antiozones of the alkyl-and aryl-para-phenylenediamines type were both found very effective with the former being slightly more effective. The effectiveness of the antiozones was found to diminish with aging, increasing with the volatility of the antiozone. In dynamic tests, waxes used by themselves had a very deleterious effect. In contrast antiozones improved considerably the resistance of the synthetic rubber to ozone. Modern antizones do not seem to surpass older products in protective effectivenes. The improvement lies in the extension of time of protection and in reduced staining and toxicity. Of the products tested Permanax 115, 4010 NA, Santoflex 77 and UOP 88 performed best.

11917 APTIC NO. 29031

Matsushima, I. and T. Ueno

ON THE PROTECTIVE NATURE OF ATMOSPHERIC RUST ON LOW-ALLOYS STEEL. *Corrosion Sci., 11(3):129-140, March 1971. 15 refs.*

The essential nature of protective rust films formed on low-alloys weathering steels by atmospheric exposure is clarified as to electrochemical behavior, catalytic ability to form sulfate from sulfur dioxide in the atmosphere, and distribution of active corrosion sites on rusted steel surfaces. Autoradiographs show that active corrosion sites are fewer on a more corrosion resistant steel and decrease with exposure time. The more continuous nature of the rust coating on such a steel is also obvious from greater anodic polarization. Furthermore, a more resistant steel forms less sulfate in polluted atmospheres due to the favorable nature of the rust. (Author abstract)

11918 APTIC NO. 29042

Japan Rustproof Technology Association, Chubu

REPORT ON METAL CORROSION BY AIR POLLUTION, 1970. *(Taiki osen niyoru kinzoku no fushoku chosa bokokusho). Text in Japanese. 32p., 1970.*

The effects of air pollution on metal corrosion in Nagoya City were determined. Fives sites where the concentration of sulfuric acid gas would be the greatest, four with average concentration, and three where the concentration would be low, were chosen for placement of exposure stands. Exposure tests on iron, copper, aluminum, and zinc and tin-plated iron sheets were conducted for a year. The data were compared with air pollution data collected at the same places and at the same time. The exposure stands were 1810 mm square and the exposure level was at an angle of 45 degrees to the horizontal plane. The pretreated metal pieces were 150 by 100 mm. After a month, all the iron pieces were rusty. After 12 months, the rust changed from brown to black and some slaked off. It was difficult to express quantitatively the deterioration of copper. A microscopic picture showed only that one spot, after many months, changed from whitish to light brown in color. The tin-plated iron sheet was whitish, lost lustre, but even after 12 months showed no rust. No direct relationship between chloride and sulfate ions and metal corrosion could be found but generally the amount of sulfuric acid gas correlated with the degree of corrosion. There was also a correlation between dust and corrosion. For copper and aluminum, the change observed by the naked eye did not correspond to the weight loss.

11919 APTIC NO. 29233

Palmer, J. D.

MORE POLLUTION CAN MEAN MORE CORROSION. *Can. Chem. Process., 55(4):79-80, 82, 84-85, April 1971.*

While the corrosive effects of polluted waters on industrial equipment have been generally lowered by purification systems, and units that control corrosion caused by air pollutants have likewise been designed, the effects of soil pollution have yet to be dealt with. The prime soil pollutant in Canada as well as other northern parts of North America is sodium chloride--deicing salt--supplemented by acidic pollutants such as sulfur dioxide and trioxide, and automobile emissions. While the effect of deicing salts is quite evident on automobiles, concrete structures, and metals in urban areas, their effect is much less evident on buried metals--water mains, gas and oil pipelines, metal sewers, highway culverts, and service station tanks. The pipeline ditch, because of differences in compaction, acts as a subsurface drainage channel, concentration surface run-off around the pipeline. This contamination appreciably increases the corrosivity of the soil, both by raising its conductivity, and by the film-destroying characteristics of the chloride ion. Soil resistivity surveys are discussed, as well as corrosion rates during different periods of the year. Losses are indicated. Ammonia injection to lower the acid dew point and other control methods are mentioned. Domestic sewage has also become more chemically corrosive because of the increasing use of chemicals in the average household.

11920 APTIC NO. 29275

Salvin, Victor S.

EFFECT OF ATMOSPHERIC CONTAMINANTS ON FABRICS--DYED AND UNDYED. *Tex. Qual. Control Paper, no. 14:56-64, 1969. 7 refs.*

Ozone and nitrogen oxides cause the fading of dyed fabrics, the fading of permanent press fabrics, and the discoloration of undyed fabrics; sulfur dioxide causes the degradation of fibers. Examples are given of the destructive effects of these contaminants on textiles. Also described are various testing procedures that correlate with actual service exposure.

11921 APTIC NO. 29304

Tsuno, Kazuo

PAINTING OF STEEL BRIDGES. *(Kokyo no toso). Text in Japanese. Kinzoku Zairyo (Metals in Engineering), 11(4):59-65, April 1971.*

Steel bridge beams are painted at the factory, and after a few months the final coating is applied at the site. The first coating deteriorates during this interval because of air pollution. Repainting at considerable cost is required every few years for 50 years, the life of the steel bridge. A survey to determine the relationship between air pollution and deteriorating paint found that slaking-off and blackening of paints were major problems. Slaking-off occurred after a year, and blackening after two to three years. Blackening can be washed away by water, but does not dissolve with thinner. It is apparently caused by the formation of lead sulfide, a reaction of hydrogen sulfide and lead ions. Substances which adhered to paints were sampled and analyzed. Laboratory tests reproduced the slaking-off to determine the best method of paint application in the polluted environment. Although salt spray and a weather-o-meter caused only a small change in paints, sulfuric acid gas and hydrogen sulfide had a significant effect. Base coating paints, both oily and polychloride vinyl, were blackened by hydrogen sulfide. Slaking-off occurs between the layer of paints applied at the factory and the layer of phthalein paints applied on site. When immersed in water for 72 hours, the adhesiveness of paint deteriorates, but when dried for 24 hours, it is almost completely restored. In the future, the nature of local pollutants must be considered when paints are selected.

11922 APTIC NO. 29346

Spedding, D. J.

THE FATE OF SULPHUR-35/SULPHUR DIOXIDE RELEASED IN A LABORATORY. *Atmos. Environ., 3(3):341-346, May 1969. 3 refs.*

Sulfur-35 and sulfur dioxide were accidentally released into a laboratory and effected the damp ceiling, bare concrete surfaces, and the waxed flooring. A low energy probe with a radiation monitor was used to detect contamination. X-ray film was used to obtain autoradiographs of some activity. The surfaces were decontaminated by wiping each surface with a cottonwool swab soaked with either de-ionized water, benzene, acetone, or 0.1 N hydrochloric acid. Then they were tested again for activity, and swabbed with the next reagent. The depth of penetration of sulfur-35/SO2 into a paper towel roll and an untreated plywood board was determined. Sulfur dioxide was absorbed by concrete, brick tile, unpainted wood, paper, damp emulsion-painted surfaces, cotton fabric, and rusty or dirty metal surfaces. Gloss-painted metal surfaces, treated wood surfaces, and clean metal surfaces absorbed little or no SO2 if they were dry and free of fatty materials.

11923 APTIC NO. 29347

Rumberg, Eckhard

DECOMPOSITION PRODUCTS AND SMOKE DEVELOPMENT AT THE BURNING OF SYNTHETICS. II. *(Zersetzungsprodukte und Rauchentwicklung bei Feuereinwirkung auf Kunststoffe. Teil 2). Text in German. VDI (Ver. Deut. Ingr.) Z. (Duesseldorf), 113(4):277-280, March 1971. 9 refs.*

Each fire involving polyvinyl chloride material causes corrosion from the formation of water vapor which condenses outside the direct fire zone on metals; carbon dioxide and other decomposition products in the water vapor. Very few iron parts remain from a fire which are not corroded. There is a higher risk in the use of all synthetics which split off hydrogen chloride during thermal decomposition. Almost all synthetics contain halogens for low inflammability. In the future it will be necessary either to lower the standards for nonflammability or accept a higher degree of corrosion if synthetics are burned.

EFFECTS-ECONOMIC

11924 APTIC NO. 27306

Snow, Gordon F., Arthur A. Millecan, and G. Douglas Barbe

PROCEDURES USED TO ESTIMATE THE ECONOMIC IMPACT OF AIR POLLUTION ON VEGETATION IN CALIFORNIA. *Preprint, Air Pollution Control Assoc., Pittsburgh, Pa., 8p., 1970. 5 refs. (Presented at the Air Pollution Control Association, Annual Meeting, 63rd, St. Louis, Mo., June 14-18, 1970, Paper 70-106.)*

The California Department of Agriculture is developing an efficient, rapid, and relatively inexpensive method for estimating and reporting the amount of economic loss caused by photochemical smog. Estimates of economic loss from injury to vegetation have ranged from $13,000,000 to $248,000,000 annually. The approach is to develop a methodology for measuring air pollution loss in a sample crop population, and projecting the measuring air pollution loss to the entire crop within a particular air basin. Methods of evaluating the amount of injury and estimating the loss with a reasonable degree of confidence are being developed. Field observers with general backgrounds in agriculture, enlisted from the staffs of county agricultural commissioners throughout the state, are being trained to observe and record air pollution injury in crops within their counties. Records of county observations will be analyzed by a central collating agency that will compile an annual estimate of losses for the use of the interested public. (Author summary)

11925 APTIC NO. 27483

Mullaney, G. J., W. H. Christiansen, and D. A. Russell

A STUDY OF FOG CLEARING USING A CO2 LASER. *J. Aircraft, 8(2): 108-113, Feb. 1971. 11 refs. (Presented at the American Institute of Aeronautics and Astronautics, Fluid and Plasma Dynamics Conference, San Francisco, Calif., June 16-18, 1969, Paper 69-670.)*

The economic loss to the airlines in the United States due to the presence of fog and haze at airports now amounts to 70 million dollars per year, and this loss is predicted to increase to over 180 million dollars per year. A process of fog dissipation by carbon dioxide radiation was explored with a series of laboratory experiments. This 10.6 micron laser radiation is strongly absorbed by liquid water but only weakly absorbed by water vapor. Thus, the laser selectively deposits its energy in the water droplet, ultimately evaporating it. Measurements of the clearing effectiveness of the CO2 radiation were made by using a 0.63 micron helium-neon laser as a visibility probe. Photographs show the initial clearing of a hole in the fog by the CO2 laser and the rise of a plume of cleared air as time progressed. The clearing effectiveness of the laser under these conditions was also investigated with different fog densities, beam dimensions, and geometries. Rate of evaporation of a stationary fog was determined by a heat balance for the individual droplets. Results were extrapolated to airport dimensions and applied to the problem of clearing an airport runway of fog. Calculations were compared with conditions at Seattle-Tacoma International and Los Angeles International airports using recorded meteorological data. A suggested geometry for a laser installation on a runway is described, and the economic feasibility is assessed.

11926 APTIC NO. 27506

Graef, A. F., L. E. Gressingh, and F. E. Miller

THE DEVELOPMENT OF NEW AND/OR IMPROVED AQUEOUS PROCESSES FOR REMOVING SO2 FROM FLUE GASES, FINAL REPORT, VOL II. *Aerojet-General Corp., El Monte, Calif., Air Pollution Control Dept., Contract PH 86-68-77, 173p., Oct. 1970.*

NTIS: PB 196781

Results are presented of laboratory studies on the ability of zinc oxide and magnesium oxide to remove sulfur dioxide from gas streams in fluidized bed systems. Special attention is given to the conditions required for minimizing the oxidation of SO2, preventing the formation of sulfate, and effecting the decomposition of zinc sulfite and magnesium sulfite. Also discussed are inhibitors and complexing agents for preventing inadvertent sorbent oxidation. Capital and operating costs are presented for an optimized fluidized zinc oxide process as applied to a new 1400 MW power plant installation. Capital costs are estimated for a magnesium-base slurry scrubbing system for a 1400 MW plant.

11927 APTIC NO. 28805

Crocker, Thomas Dunstan

SOME ECONOMICS OF AIR POLLUTION CONTROL. *Missouri Univ., Columbia, Thesis (PhD), Ann Arbor, Mich., Univ. Microfilms, Inc., 1967, 274p. 159 refs.*

The economic aspects of the atmospheric pollution problem caused by the detrimental effects of airborne fluorides emanating from phosphatic fertilizer manufacturing processes upon the beef cattle and the citrus industries of Polk County, Florida, were studied wit an ultimate view to the economic efficacy of alternative air pollution control policies. A review of the effects of airborne fluorides upon plants and animals gave no grounds for attempting to economically construct meaningful receptor damage functions from these materials. There are two distinct advantages of the use of true sale prices of receptor lands to determine differential receptor damages. First, the market rather than the investigator estimates the near infinitude of relevant relations and their interactions; and second, the responses of the owners of the physical and biological entities damaged by air pollution to varying levels of pollutant fumigations are better taken into account. A cross-sectional, multiple regression analysis of agricultural land values resulted in a positive relation between frequency of pollutant fumigations and the market value of pasture sites; and a negative relation between frequency of pollutant fumigations and the market value of citrus sites. Two basic conclusions about air pollution control policy can be drawn from the Polk County case: 1) the imposition of various physical and economic constraints upon the actions of receptors and emitters can generate gains from trade where all such gains had previously been exhausted; and 2) that assumption absolutely necessary for the economically efficient working of the emitter charge stating that negotiations between emitters and receptors are impossible is not fulfilled in reality.

11928 APTIC NO. 28955

Middleton, John T., John Herbert Hollomon, Thomas F. Malone, and James M. Quigly

CONTROL OF ENVIRONMENT--ECONOMIC AND TECHNOLOGICAL PROSPECTS. *In: Environmental Improvement (Air, Water, and Soil). Ralph W. Marquis (ed.), Dept. of Agriculture, Washington, D. C., Graduate School, p. 51-79, Oct. 1966.*

Examples of land, water, and air pollution are reviewed and the economic and technological prospects for restoring the quality of those resources as well as the suitability of legislation to achieve the needed control, are assessed. Land use is principally controlled through ownership. The ever-increasing use of land for industry and urban expansion pollutes the air and causes an estimated crop damage of $500,000,000 a year in this country. The quality of air is determined by the uses made of it and by the pollutants injected into it by man. It is estimated that the combusting of fossil fuels used throughout the United States in one year requires 3,000 cubic miles of air, of which the motor vehicle uses about 21%, the greatest degradation is brought about by the use of air to support combustion. Programs designed to restore the quality of the environment should be established for naturally definable geographic and meteorological areas in which the entire population is involved. Local government bodies should yield to higher or multigovernment control bodies. It is inimical to resource management that the quality of the environment be upheld primarily at the expense of the polluter and not at the expense of the general public. We must have a way to assess the social costs of air and water pollution and to decide how much benefit would come from various ways of reducing those costs. Present systems of observations, prediction, and measurement of the degree of pollution and its nature are inadequate. An increase of 10% in carbon monoxide content in the atmosphere over the past hundred years is noted. Further increases may bring drastic climatic changes. Controlling the weather is becoming a rational proposition.

11929 APTIC NO. 29038

SO2 EMISSION CONTROL TECHNIQUES COMPARED. *Brit. Chem. Eng., 16(2/3):107, Feb.-March 1971. 1 ref.*

Production costs of sufuric acid from the Cat-Ox and Wellman- Lord systems are graphically compared, as are overall costs of the two processes. The Cat-Ox process is an adaptation of the familiar contact process for sulfuric acid manufacture. The Wellman-Lord process is characterized by cyclic absorption- desorption, with sodium sulfite as the absorbent. The indicated overall costs of the Wellman-Lord system are lower than those of the Cat-Ox system at sulfur dioxide concentrations below about 1.1% and high at concentrations above that level. The acid production costs for both systems decrease with an increase of SO2 concentration but the Wellman-Lord System reaches virtually a minimum at 2.5% because of the strong base (sodium) of the absorbent. The production of elemental sulfur with the Wellman-Lord process is 3% higher in capital costs and 10% higher in annual cost than the production of sulfuric acid. Both processes appear to be as economic as any existing or potential processes.

11930 APTIC NO. 29186

Vinokurov, I. S., S. T. Zolotukhin, G. R. Ostanovskii, E. I. Ol khovskaya, A. Z. Ryzhavskii, L. N. Raitman, and Yu. M. Yudovich

TECHNICAL-ECONOMIC COMPARISON OF DRY AND WET GAS CLEANERS FOR CONVERTERS WORKING WITH COMPLETE COMBUSTION OF CARBON MONOXIDE. *Steel (USSR) English translation from Russian of: Stal), no 11:925-926, Nov. 1970. 3 refs.*

Operating, capital, and corrected costs are calculated for three gas cleaning systems for a steelmaking plant with three 130-ton oxygen converters. The three systems compared are as follows: (A) dry electrostatic precipitator; (B) bag filters (with preliminary cooling of gas in a scrubber (B1) and in a regenerator (B2); and a venturi scrubber with a variable 330 times 301 mm throat and film-jet spraying head. Variants B2 and A have clearcut advantages over C in terms of operating costs; the additional capital investments they require will be recovered 4.1 yrs and 1.6 yrs, respectively. Variant B1 is uneconomical. In view of the lack of experience in the use of bag filters, electrostatic precipitators are to be recommended.

11931 APTIC NO. 29299

Mueller, James H.

WHAT IT COSTS TO CONTROL PROCESS ODORS. *Food Eng., 43(4):62-65, April 1971.*

The accepted and recognized method of controlling organic fumes and odors is to raise the process exhaust to 1400 F for 0.5 sec. The three types of equipment that can meet this requirement are compared with reference to total annual cost, factors influencing total cost, and heat recovery efficiency. The types are afterburner; afterburner with heat exchange; and thermal regenerative air purification system (TRAPS). While initial equipment cost is low, total annual costs of an afterburner are $202,510 in contrast to $119,090 and $69,620 for afterburner with heat exchange and the TRAPS system, respectively. A major factor in the additional annual costs of an afterburner is the very high fuel cost ($181,000).

11932 APTIC NO. 29344

Sander, Horst P.

ECONOMIC ASPECTS CONCERNING ENVIRONMENTAL PROTECTION. *(Wirtschaftliche Aspekte zum Umweltschutz). Text in German. Wasser Luft Betrieb, 15(4):149-151, 1971.*

Environmental protection may have economic effects on the production process as well as on the product. Under favorable circumstances, plans for production processes, as well as products, which recognize the need for environmental protection might be no costlier than programs which completely disregard the environment. It is even possible that, in some cases, programs which include environmental protection will be less costly than conventional ones. In general, however, environmental protection will cost additional money. This is primarily because, given the present state of the art, air, water and noise pollution can be combated efficiently only by the aquisition of additional equipment instead of through changes in production processes or the product.

STANDARDS AND CRITERIA

11933 APTIC NO. 27266

DuBois, Arthur B.

ESTABLISHMENT OF 'THRESHOLD' CO EXPOSURE LEVELS. *Ann. N. Y. Acad. Sci., 174(1):425-428, Oct. 5, 1970. 10 refs.*

The presently recommended limits for carbon monoxide exposure are indicated for industrial workers and military and space personnel. Whether levels to be proposed for continuous exposure of the population at large must differ from those presently existing for exposure of special groups over limited periods of time is discussed. Whether a threshold exists for CO exposure is examined, and the steps leading towards standards for CO are reviewed.

11934 APTIC NO. 27445

Kiyoura, R., M. Mundasa, G. Uwanishi, S. Iguchi, and T. Kuramoto

STUDIES ON POLLUTANTS AND POLLUTION LEVELS IN SOME OF THE INDUSTRIA AND URBAN AREAS OF JAPAN. *Preprint, Air Pollution Control Association, Pittsburgh, Pa., 25p., 1970. 9 refs. (Presented at the Air Pollution Control Association, Annual Meeting, 63rd, St. Louis, Mo., June 14-18, 1970, Paper 70-147.)*

The Japanese Ministry of Health and Welfare which enacted the air quality standards for sulfur oxides has not given significant consideration to particulates in ambient air. An hourly value of 0.1 ppm SO2 or less is to be maintained for more than 88% of the total hours within a year, and the 24-hour average value of 0.05 ppm or less is to be maintained for more than 70% of the total days within a year. The combustion of sulfur containing materials is mentioned, as well as the effects of sulfur dioxide and sulfuric acid mists. Particulates are also described; a diameter of about 2 microns is widely recognized as the division between respirable and non-respirable particles. Air pollution episodes at London, the Meuse Valley, and Donora are briefly considered. Results are cited from the monitoring and analysis of sulfur oxides and several particulates.

11935 APTIC NO. 27763

Yamaguchi, Tsutomu

ADMINISTRATIVE MEASURES FOR AIR POLLUTION PREVENTION. *(Taiki osen boshi gyosei ni tsuite). Text in Japanese. Preprint: Society of Electro-Chemistry, Tokyo (Japan), Kanto Div., 24p., 1971. (Presented at the Seminar on Air Pollution, Tokyo, Japan, Feb. 3-4, 1971, Paper 1.)*

The present state of air pollution in Japan is outlined, with regard to the revisions of the recent amendment to the Air Pollution Prevention Law, the planned measures and criteria with regard to the low-sulfur fuel policy, and the 1971 government budget allocated for prevention measures. Of 211 air pollution monitoring stations scattered throughout the country, 83 have indicated a pollution value which does not comply with the legal criterion. The number of cities which failed to meet the air quality standards during 1969 increased to 34 from 26 in 1968. More stringent pollution control will be applied with the recent revision of the Law, while prefectural governors will also have the power to order private industries to stop or restrict their operations if the need be. Fuel consumption, its average sulfur content, and degrees of air pollution have been estimated for 1973 and 1983, with criteria for its control.

11936 APTIC NO. 27775

ENVIRONMENTAL PROTECTION AGENCY PROPOSES NATIONAL AIR QUALITY STANDARDS. *J. Air Pollution Control Assoc., 21(3):149, March 1971.*

The primary and secondary air quality standards proposed by the Environmental Protection Agency (formerly NAPCA) for six classes of air pollution are given. The classes are sulfur oxides, particulate matter, carbon monoxide, photochemical oxidants, nitrogen oxides, and hydrocarbons. The primary standards are designed to protect human health, the secondary standards to protect against effects on soil, water, vegetation, materials, animals, weather, visibility, personal comfort and well-being.

11937 APTIC NO. 27874

Japan Environmental Hygiene Center, Tokyo (Japan)

PUBLIC NUISANCE COUNTERMEASURES TODAY AND TOMORROW. *(Kogaitaisaku no genjo to hoko). Text in Japanese. Preprint, 17p., 1970. (Presented at the Japan Environmental Hygiene Center, Public Nuisance Seminar, 1970.)*

Regulatory reference materials are presented including an extract of the Public Nuisance Countermeasure Basic Law, a table of ordinances and regulations conerning public nuisance countermeasures, the environmental criteria involving sulfides decided upon at the Feb. 12, 1969 Cabinet meeting, and Measures Involving Mizushima Area of Okayama Prefecture. Article 9 of the Basic Law provides that the Government shall set up with regard to environmental conditions involving air pollution, water contamination and noise, criteria to be maintained for the purpose of protecting human health and preserving the environment. Environment criteria involving sulfides, include the following: Throughout the year, the number of hours for which the hourly average is below 0.2 ppm must be more than 99% of the total number of hours per year. Throughout the year, the number of days for which the daily average of the hourly values is below 0.05 ppm must be more than 70% of the total number of days per year. Also throughout the year, the number of hours for which the hourly value is below 0.1 ppm must be more than 88% of the total number of hours per year. Throughout the year, the annual average of the hourly values must not be more than 0.05 ppm. At any location, throughout the year, the number of days for which air pollution emergency measures specified by law are necessary must not be more than 3% of the total number of days per year, and must not continue more than three days in a row.

11938 APTIC NO. 28815

Cattaneo, A. G. and Frank Bonamassa

CALIFORNIA REQUIREMENTS FOR ASSEMBLY-LINE TESTING OF VEHICLE EMISSIONS. *Preprint, Society of Automotive Engineers, Inc., New York, 4p., 1970. 4 refs. (Presented at the Society of Automotive Engineers National West Coast Meeting, Los Angeles, Calif., Aug. 24-27, 1970, Paper 700672.)*

Assembly-line testing is a legal requirement in California, intended to implement the motor vehicle emission control effort and to facilitate compulsory vehicular inspection and maintenance programs. All contaminants for which there are emission standards must be measured, and the same test must be used for every vehicle in the same class. Several test cycles have been tried, but inadequate correlation with the official test procedure for all vehicle makes and models points to the adoption of the 'hot-start' version of the official test procedure as the eventual assembly-lin test. (Author summary modified)

11939 APTIC NO. 28845

Industrial Gas Cleaning Inst., Inc., Rye, N. Y., Electrostatic Precipitator Div.

CRITERIA FOR PERFORMANCE GUARANTEE DETERMINATIONS. *Ind. Gas Cleaning Inst. Pub., no. E-P 3, 3p., 1965.*

Guidelines for the determination of performance characteristics of electrostatic precipitators are presented. Pertinent standards include gas volume determination, gas distribution to the precipitator, and gas conditioning. Uniform gas distribution shall mean that a velocity pattern five feet or less ahead of the precipitator inlet flange shall have a minimum of 85% of the readings within plus or minus 25% of the average velocity in the area with no reading varying more than plus or minus 40% from the average. Process maintenance and service operations change dust loading and flow conditions to the precipitator and will affect performance efficiency; minor adjustments are also made in firing controls, air and fuel rates, fuel sources, and raw materials. Thus, performance tests should be scheduled at a time when the operating conditions are in close accord with specifications. Visual dust determinations and outlet stoppers are mentioned in relation to precipitator guarantees.

11940 APTIC NO. 28870

Hyatt, E. C., H. F. Schulte, R. N. Mitchell, and E. P. Tangman, Jr.

BERYLLIUM: HAZARD EVALUATION AND CONTROL IN RESEARCH AND DEVELOPMENT OPERATIONS. *A.M.A. Arch. Ind. Health, 19(2):211-220, Feb. 1959. 6 refs.*

Industrial hygiene studies of research and development operations using beryllium and its compounds at the Los Alamos Scientific Laboratory have shown that with proper control measures the Atomic Energy Commission recommended standards can be met satisfactorily. Basic control measures consist of adequate local exhaust hoods, respiratory protective equipment, and good housekeeping. In August 1951, the AEC issued recommendations for the control of beryllium hazards which included standards of 2 micrograms/cu m, as an average concentration throughout an eight hour day, and 25 micrograms/cu m to which no personnel should be exposed for any period of time. The handling and storage of beryllium for critical assemblies is considered, as well as beryllium target preparation for use in the cyclotron. The synthesis of pure beryllium hydride is mentioned; several methods of welding and soldering beryllium metal have been investigated. A summary of air sampling results during machining and milling and in exhaust stacks is presented. The storage and inventory of beryllium and its compounds are indicated, as well as methods of sampling and analysis. Whatman 41 filter paper and a Staplex high-volume sampler have been utilized, while filter papers have been analyzed using a method based on the fluorescence of morin in an alkaline solution.

11941 APTIC NO. 29376

Swan, David

STUDY OF COSTS FOR COMPLYING WITH STANDARDS FOR CONTROL OF SULFUR OXIDE EMISSIONS FROM SMELTERS. *Mining Congr. J., 57(4):76-85, April 1971. (Presented at the National Industrial Pollution Control Council meeting, Washington, D. C., March 8, 1971.)*

The concentration of copper smelters in the U. S. is indicated and sulfur dioxide emissions from these smelters are related to the ambient air quality requirements of the Clean Air Act Amendements of 1970. Capital costs, derived from computer studies of smelters representing 88% of the U. S. copper-smelting capacity, are presented for technological alternatives for meeting primary ambient air standards or 90% emission control standards. The various alternatives using existing technology applied on an industry-wide basis would cost $500 million to $1.2 billion. For instance, the choice of production curtailment, air dilution, and sulfuric acid plants would require an investment of about $572 million. This system would meet the 24-hr ambient requirement but not the 90% emission standard. Replacing smelters using acid plants as the primary SO2 recovery method would cost $1.2 billion. This would meet the annual ambient and the 90% emission standard. Of the technology now being tested commercially, limestone scrubbers would meet the annual and 24-hr ambient requirements but not the 90% emission limit. The would require an industry investment of $293 million. If the scrubber were followed by a caustic scrubber, the investment cost would increase to $345 million. This equipment would meet the annual ambient standard and the 90% emission limit, but would introduce a by-product disposal problem. It is suggested that the 90% emission requirements be eliminated and that the time allowance for development of new processes to meet the Clean Air Act requirements be extended.

11942 APTIC NO. 29409

Shimizu, Takeo

STANDARDS AND CONTROL TECHNIQUES OF AUTOMOBILE EMISSION IN OVERSEAS COUNTRIES. *(Kaigai ni okeru jidosha no haishutsu gasu to taiki osen taisaku). Text in Japanese. Jidosha Gijutsu (J. Soc. Automot. Engrs. Japan), 25(3):214-221, March 1971. 9 refs.*

Because of the control measures for automotive exhaust emissions in the exhaust gas from automobiles, engineers efforts to increase power and lower fuel consumption must be sacrificed to decrease these emissions. The control measures taken by California are the most severe. After 1977, gasoline will contain no lead, and in 1973, all automobiles will be given a 7-mode cycle test. Compared with the U. S. and Japan, European controls are less strict. Only CO during idling is controlled in France and West Germany. In the future, uniform ECE control will be in force for the United Kingdom, and France, Germany, and Italy. The ECE test cycle and total bag method will become applicable and are almost as severe as the 7-mode test method of the U. S. The 1970 car models in the U. S. have emission levels about 50% lower than the pre-control ones. In order to meet these control measures, recent American models have engines to cope with the use of non-leaded gasolines. Engine modification requires no alteration in engine production facilities. Air-injection alterations cost a little more than engine modification, but have the advantage of decreasing carbon monoxide and hydrocarbons without a radical change in the engines. The electronic gasoline injection method in use in Europe is simpler in structure. For cars used in California, the fuel tank must be able to steam out more fuel. All the fuel vapor generated by the fuel tank is absorbed by a canister. However, more drastic measures will become necessary, since 1971 models must lower emission level to a fifth, and 1980 models, to about one-tenth of the present level. Both the engine power and fuel capacity will decrease. For nitrogen oxides, delay in ignition, adoption of smaller air fuel ratios, and catalysts are effective. Automobile engineers must find techniques to combine these methods in order to lower emission and cost without lowering the performance of the engines.

11943 APTIC NO. 29410

Ogata, Masahiko

SO2 COUNTERMEASURES AND DESULFURIZATION OF HEAVY OIL. *(SO2 taisaku to juyu datsuryu). Text in Japanese. Sekiyu Gakkai Shi (J. Japan Petroleum Inst., Tokyo), 14(3):162-165, March 1971.*

The national environmental standard recently established by the Japanese government for sulfur dioxide is less than 0.2 ppm hourly maintained 99% of the time for all areas. Three types of areas were set up: areas of advanced SO2 pollution where the standard is to be reached within 10 years; areas where SO2 pollution has begun, where the standard is to be reached within 5 years; newly industrialized areas where the standard is to be maintained from the beginning. By the end of 1972, about 24 desulfurization units are expected to be in operation. A national project to develop desulfurization technologies is underway. Test plant research operation is being carried out.

LEGAL AND ADMINISTRATIVE

11944 APTIC NO. 27312

Goldshore, Lewis P. and John J. Tozzi

THE STATE'S ROLE IN THE DEVELOPMENT OF LOCAL AIR POLLUTION CONTROL PROGRAMS. *Preprint, Air Pollution Control Assoc., Pittsburgh, Pa., 17p., 1970. 3 refs. (Presented at the Air Pollution Control Association, Annual Meeting, 63rd, St. Louis, Mo., June 14-18, 1970, Paper 70-90.)*

The history of air pollution control in New Jersey is examined, particularly with reference to the development of the state-local government relationship. In 1954, the New Jersey legislature enacted the Air Pollution Control Act, relying on the state's police power and thereby becoming one of the first states in the nation to recognize and to establish mechanisms by which the problem of air pollution could be controlled. The first step in approaching a coordination of effort was the issuance by the State Department of Health of 'Guidelines for Approval of Local Government Ordinances,' which outlined the areas where the control activity of local governments should be directed. These included such problems as open burning, smoke from fuel burning equipment, visible emissions from incinerators, and general air pollution nuisances. A local program liaison officer was appointed in July of 1969, and a program of field visits was commenced in order to explain in detail the elements of a local program on an individual basis to interested officials. Also, a comprehensive training program for local personnel is in the process of being developed.

11945 APTIC NO. 27467

Hokkaido. Dept. of Planning (Japan), Section of Public Nuisance

THE PRESENT SITUATION OF AIR POLLUTION AND ITS COUNTERMEASURE. *(Taikiosen no genkyo to taisaku). Text in Japanese. In: An Outline of Countermeasure of Public Nuisance. (Kogai taisaku jigyo gaiyo). Chapt. III, p. 45-74, March 1970.*

The air pollution in Hokkaido is principally caused by the heating system during winter at the center of Sapporo city, Asahikawa city and Kushiro city, while around Muroran city and Kushiro city it is by the production activity in factories. The measurement of falling dust, sulfurous acid gas (PbO2 method, automatic recording equipment), floating dust was started at Sapporo city in 1959, at Obihiro city in 1962, and at Asahikawa city, Tomakomai city, Kushiro city and Muroran city. Concerning the influence on human body, since 1966, the influence on pulmonary function, the carcinogens in polluted substances, and the influence of central heating on health welfare have been studied. Based on the above data, the location and heating condition of factories or offices is advised, and a policy which meets the characteristics of the pollution source is given to each designated district of the Air Pollution Prevention Act. Besides these, the study of combustion equipments and smoke generation by coal, trial production of a simple smoke meter, photographing of the smoke movement in the sky above Sapporo city, weather observations of the ground wind, upper wind and the inversion layer, are being carried out.

11946 APTIC NO. 27582

Linzon, Samuel N.

THE ROLE AND ACTIVITIES OF THE PHYTOTOXICOLOGY SECTION IN THE ONTARIO AIR MANAGEMENT BRANCH. *Preprint, Air Pollution Control Assoc., Toronto, Ontario Section, Air Pollution Control Assoc., Pittsburgh, Pa., TR-7 Agricultural Committee, and Ontario Dept. of Energy and Resources Management, Toronto, Air Management Branch, 19p., 1970. (Presented at the Impact of Air Pollution on Vegetation Conference, Toronto, Ontario, April 7-9, 1970.)*

The Air Management Branch of the Department of Energy and Resources Management is the enforcement agency responsible for controlling air pollution in Ontario. The Branch is organized into several disciplines comprising Abatement, Approvals, Automotive Emissions, Chemical Laboratory, Meteorology and Air Quality, and Phytotoxicology. The principle objectives of the Phytotoxicology Section are to determine the degree and extent of air pollution injury on all types of vegetation throughout Ontario. These objectives are pursued by investigating complaints concerning suspected air pollution injury to vegetation; by conducting surveillance studies in areas of concern; and by carrying out field and laboratory research studies. The Phytotoxicology Section visited 57 complainants in 1968 and 76 in 1969. Many of these complainants were residents of the Port Maitland area, where an electric reduction company is a source of fluoride pollution. Surveillance visits to areas of concern increased from 14 in 1968 to 41 in 1969, with the number of vegetation samples taken during these visits increasing from 157 to 1741. Vegetation data obtained in surveillance studies in conjunction with air quality and meteorology records provide supporting evidence for abatement recommendations. The vegetation research studies aid in the establishment of air quality criteria and standards for the protection of regional agriculture and forestry. (Author abstract modified)

11947 APTIC NO. 27664

SUMMARY OF 14 LAWS RELATED TO PUBLIC NUISANCE AND THE REMAINING PROBLEMS. *(Kogai kankei 14 hoan no gairyaku to nokosareta mondaiten). Text in Japanese. Yosui to Haisui (J. Water Waste), 13(2):205-209, 1971.*

The article discusses the 14 laws related to public nuisance control that were revised during the extra session of the Japanese Diet in 1970. The laws revised include: Basic Law Concerning Public Nuisance Control, Public Nuisance Criminal Justice Law, Air Pollution Control Law, Water Pollution Control Law, Toxic Substance Control Law, Street Traffic Control Law, Ocean Pollution Control Law, Solid Waste Disposal and Sanitation Law, Noise Control Law, and others. The main feature of the revised Basic Law is that the clause including in harmony with the healthy growth of the economy is deleted. For the Air Pollution Control Law, thchanges are as follows: Lead is included in the definition of smoke, and lead and hydrocarbon are added to the definition of automobile exhaust. In the section on emergency measures, the word 'advice' is changed to 'order', in connection with the government's notice to the polluters. Further, the section noting the 'in harmony with the healthy growth of the economy' is delected, and the law is made effective throughout the country, and not merely in designated areas, as was the case before the revision. The Law will go into effect six months after the day of promulgation.

11948 APTIC NO. 27677

Osaka Prefectural Government (Japan)

OSAKA PREFECTURE PUBLIC NUISANCE CONTROL CODE (PROPOSED). *(Osakafu kogi boshi joreian). Text in Japanese. 29p., Feb. 1971.*

The proposed code for Osaka Prefecture consists of general regulations, measures to control public nuisances, such as environmental standards, public nuisance control plans, and regulations for factories, including regulating smoke and dust, and reporting nuisance-creating facilities. Public nuisances from factories consist of smoke and dust, polluted water, bad odors, noise, and vibrations. There are special provisions concerning extraction of ground water, special construction activities, automobile traffic, use of loud speakers, and monitoring of air pollution. Air pollutants under consideration are sulfur oxides, dusts, cadmium, chlorine, hydrogen fluoride, lead and other substances potentially harmful to human health.

11949 APTIC NO. 27678

Kanagawa Prefecture (Japan), Public Nuisance Control Promotion Headquarters

REGULATIONS CONCERNING THE PREVENTION AND CONTROL OF PUBLIC NUISANCE. *(Kogai boshi jorei kankei reikishu). Text in Japanese. 35p., 1970.*

The regulations and amendments which concern the prevention and control of public nuisances in Kanagawa Prefecture are listed. Regulations concerning enforcement are also included. Various machines, manufacturing processes, and production processes that involve public nuisances, such as noise, vibration, water pollution smoke, dust, gas, and odor are tabulated and are categorized according to the applicable sections of the regulation. Various sample forms used to report the nuisance producing facilities and operations are attached. Environmental standards are presented for diverse pollutants in water according to the water areas of the prefecture, and the Japan Industrial Standard tests applicable to each pollutant are listed. Standards are also given for air pollutants such as sulfur oxides, ammonia, hydrogen cyanides, and nitrogen dioxide, as well as for the allowed stack heights. The levels of noise allowed for different times of day and for different geographical areas are specified.

11950 APTIC NO. 27683

Oshio, Toshiki

ENVIRONMENTAL STANDARDS AND PUBLIC NUISANCE PREVENTION PROGRAM. *(Kankyu jijun to kogaiboshi keikaku). Text in Japanese. Osaka Prefectural Government (Japan), Public Nuisance Seminar Text, Part 3, 1015, 1970.*

The fundamental plans and standards drafted for a public nuisance prevention program involving the Osaka region, one of the largest industrial and commercial centers of Japan is presented. In view of the air and water pollution as well as the noise intensity increasing year after year in the region, criteria are stipulated, which should be met by 1975. Fundamental approaches to check air pollution are given. Corrective measures will be concentrated on stationary sources of the pollution, particularly in the Nishoyodogawa area of Osaka where air pollution has been high. Some restrictige measures will be also taken for installations of new plants in the region if they might constitute sources of air pollution. The use of low-sulfur fuel, desulfurizers, and dust collectors will be pushed vigorously. Technical and administrative guidance will be given for the establishment of cooperative waste disposal plants or facilities if individual plants can not afford such facilities. Standards are listed for sulfur oxides, suspended particulates, and carbon monoxide, according to the maximum allowable values, and the district to which the standards are applicable.

11951 APTIC NO. 28869

Dept. of Commerce, Washington, D. C., Technical Advisory Board, Panel on Automotive Fuels and Air Pollution

THE IMPLICATIONS OF LEAD REMOVAL FROM AUTOMOTIVE FUEL. (INTERIM REPORT). *35p., June 1970. 1 ref.*

NTIS: PB 194880

The addition of lead alkyls is the least expensive way to increase the octane rating of motor fuel. However, these additives interfer with the development of exhaust treatment systems, especially those using catalysts. It is recommended that legislation be enacted to establish the authority of the Federal government to regulate fuel additives. Early difinitive action on the part of the Federal government is required to provide conditions conducive to the development of a wide variety of emission control devices and to assure smooth adjustments by the industries affected. Action is recommended that will bring about an incentive for the purchase of the low-lead fuel. Petroleum refiners must also receive adequate warning of contemplated changes in automotive fuel requirements in time to make refinery changes in an orderly manner. The effect of insufficient maintenance of present cars on total vehicle emissions is noted, and it is recommended to encourage states to include an automobile emission check as part of their vehicle inspection programs. Effects of lead removal are considered, as well as emission control technology. Thermal exhaust gas reactors, exhaust gas recirculation systems, and catalytic devices are mentioned. Th cost of lead reduction is indicated, as well as the status of petroleum refineries.

11952 APTIC NO. 28881

Pepermans, G.

CITY PLANNING IN RELATION TO HEATING AND AIR POLLUTION PROBLEMS. *(L'urbanism en relation avec le probleme du chauffage et celui de la pollution atmospherique). Text in French. Chaleur et Climats (Waterloo), 34(404):83-91, Aug. 1969.*

Zoning and creation of industrial parks are strongly recommended as a means of combatting traffic congestion, fire hazards, overpopulation of areas, overloading of public transportation, and congestion of private traffic. Distances workers have to travel ca be reduced and pollution of vegetation can be avoided. Methods for preventing or decreasing air pollution from industrial waste gases are available, such as sedimentation of solid and liquid particles contained in gases, filtering, and high chimneys for dispersion of gases carrying sulfurous anhydride. The pollution of cities by automobile exhausts could be largely eliminated by banning car traffic from central city districts and substituting public transportation. As a remedy for the widespread pollution caused by prevalent types of home heating, the creation and use of central heat generating plants is envisaged, or a complete change-over to electric heating. In other areas where generation of electric powe is expensive, electric heating can still be economical, bearing in mind the greater efficiency factor of this energy source, the avoidance of piping boilers, fuel reservoirs, and radiators. Cleanliness and elimination of all causes of pollution appear to make the use of electricity for home heating most desirable.

11953 APTIC NO. 28902

Bellis, Isadore, Herbert F. Kolsby, and Edward L. Wolf

LEGAL APPROACH TO INDUSTRIAL POLLUTION. *Trial Mag., June-July 1968 p. 29-34.*

In view of the ineffectiveness of federal legislation in alleviating the problem of air pollution, increasing reliance may be put on the machinery of the law. This new approach involves bringing before a court and jury the victim, the polluter, and the unassailable scientific facts relative to the particular pollutant. The preparation of these cases requires air sampling by a qualified atmospheric physicist or an industrial hygienist. The toxicant must be identified, its concentration and dispersion determined, and the exposure to which the plaintiff has been subjected established Equal by important are the services of a medical investigator who will establish proof of the medical aspect of a case. This proof will frequently prove the liability aspects of the case. Techniques employed in air sampling and in establishing the medical aspects are reviewed together with some well-founded principles that impose liability for unreasonable air pollution.

11954 APTIC NO. 28933

Nonhebel, G.

LEGISLATION ON AIR POLLUTION. *In: Gas Purification Processes. G. Nonhebel (ed.), London, George Newnes Ltd., 1964, Chapt. 2, p. 19-42. 9 refs.*

The Alkali Work Act (1906), the Clean Air Act (1956), and the Public Health Act (1936) of Great Britain are discussed. Major items in the Acts dealing with air pollution are tabulated. Alkali Works are defined as all plants for the manufacture of sulfates of soda or potash, or for the treatment of copper ores by common salt or other chlorides whereby any sulfate is formed, in which muriatic acid gas is evolved. Provisions of the Alkali Act define registration and conditions, limits for escape, heights of chimneys noxious or offensive gases, and regulated and nonregulated works. The Clean Air Act is divided into the following groupings: smoke from industry; grit and dust; chimneys; processes regulated under the act; and smoke from houses and smoke control areas. Provisions of the Clean Air Act which are related to gas purification plants regulate smoke density meters, dust emission, and heights of chimneys. Provisions in the Factories Acts of 1937 and earlier years include the removal of dust or fumes from workrooms and the protection of workers in industries where dust is a special hazard.

11955 APTIC NO. 28954

Muskie, Edmund S., John A. Carver, Jr., Dean W. Coston, and John A. Baker

ENVIRONMENTAL IMPROVEMENT--INSTITUTIONAL AND GOVERNMENTAL ASPECTS. *In: Environmental Improvement (Air, Water, and Soil). Ralph W. Marquis (ed.), Dept. of Agriculture, Washington, D. C., Graduate School, p. 31-47, Oct. 1966.*

Contamination of the environment is a social problem and public decisions and actions are needed for improvement. We must accelerate construction of waste treatment facilities and develop methods of advanced waste treatment and purification of water for re-use. Air pollution control efforts have been slower than those for water pollution control. The Clean Air Act of 1963 broadened the Federal program. In 1965 controls were enacted on automotive exhaust emissions. Among the major remaining problems are the determination of how much money needs to be spent, what institutions can best finance and manage pollution control programs, what financial incentives or penalties are desirable, and how to prevent overlapping Federal, regional, State and local programs from impeding efforts to improve the quality of our environment. A clear perspective on pollution which occurs not as the waste products of human activities but which is deliberately introduced into the environment for specific reasons is needed. Thus, such substances as drugs, food additives, pesticides, and agricultural chemicals, because of poorly understood side effects, long persistence in the environment, or possible synergistic effects, present an increasingly complicated problem in environmental protection.

11956 APTIC NO. 28985

Graber, Ralph C., Frederick K. Erickson, and William B. Parsons

MANPOWER FOR ENVIRONMENTAL PROTECTION. *Environ Sci. Technol., 5(4):314-319, April 1971.*

In 1970, the total personnel employed in environmental protection exceeded 243,000 -- an estimate based on over 35,000 engineers; 37,000 scientists, sanitarians, etc; 69,000 technicians; and 101,000 aides. By 1975, the need for trained, education personnel for environmental control will be double the present supply. The demand will continue to outstrip the supply in 1980. Academic institutions offering environmental protection graduate programs (supported by selected federal grant programs) are listed, together with the area of program emphasis.

11957 APTIC NO. 29015

POLLUTION CONTROL: THE PERILS OF PURITY. *Ind. Week, 169(3):28-38, April 1971.*

Many industries are attempting to balance short-term solutions to pollution problems with long-term considerations including not only possible code changes, but also foreseeable increases in plant capacity and improvements or modifications to the manufacturing processes. However, management efforts to invest sharehold money wisely are frustrated by conflicting guidance from technical consultants and conflicting guidance from government agencies. It is suggested that there must be a more rational solution in terms of public education on the part of industry equipment suppliers, and the government. Without this, there is always the risk of environmental improvement being achieved but unrecognized.

11958 APTIC NO. 29019

Randolph, Jennings

A WORLDWIDE COMMITMENT. *J. Air Pollution Control Assoc., 21(2):57-59, Feb. 1971*

There is a need for a coordinated worldwide system to monitor pollution in the total environment. From past experience with nuclear fallout it is known that radioactive wastes are transported widely and rapidly through the environment. Comparable information on chemical pollutants is lacking, and there is a demand for more extensive, continuous data on which to base an international control effort. Such a system would be invaluable in adding to knowledge of the worldwide increase in carbon dioxide resulting fro the burning of fossil fuels and of large-scale fluctuations in the particulate content of the atmosphere. The mechanisms and guidelines for an international approach to pollution monitoring and control must be resolved by gatherings like the United Nations Conference on the Human Environment planned for 1972 in Sweden.

11959 APTIC NO. 29028

Fox, Irvin K.

THE USE OF STANDARDS IN ACHIEVING APPROPRIATE LEVELS OF TOLERANCE. *Proc. Natl. Acad. Sci. U. S., 67(2):877-886, Oct. 1970. 11 refs. (Contributed to the Symposium on Aids and Threats to Society from Technology, April 1970.)*

The government has established standards of tolerance to deal with the external and side effects of technology. These standards attempt to limit external effects, inform and protect the consumer about side effects, and distribute the costs and returns equitably. In order to develop levels of tolerance, physical and biological information must be collected, but the establishment of standards remains a value judgment. In the absence of an objective basis for establishing levels of tolerance, such levels have usually been determined through the interaction of those affected, operating under rules specified in law, regulations, or custom. Standards are often misleading, because they represent a flexible target, rather than an absolute limit. Thus, an alternative to the standards approach is needed. Informing the user of side effects is one approach. Decisions could also be made on an ad hoc basis in light of present conditions. Thirdly, a charge system could compel the producer of external effects to pay a cost equal to the damages imposed on others.

11960 APTIC NO. 29037

ORGANIZING A POLLUTION CONTROL PROGRAM. *Plant Eng., vol. 23:60-61, Sept. 4, 1969.*

An effective pollution abatement program can be created by the plant engineer in cooperation with an advisory committee formed to supply him with data about the company's future plans of operation. The advisory committee should consist of representatives of all departments within the plant, e.g., accounting, production, purchasing, facilities engineering. Once a program is established and operating, its smooth functioning can be ensured by regularly scheduled meetings of all individuals involved. Most important, members of the advisory committee must be in constant touch with all plant operations so that timely preventive or control measures can be taken.

11961 APTIC NO. 29045

Webster, Eleanor M. and T. E. Walton

A NEW DIRECTION FOR THE FUTURE: A DEPARTMENT OF ENVIRONMENTAL RESOURCES FOR THE COMMONWEALTH OF PENNSYLVANIA. *Natural and Historic Resource Associates, Philadelphia, Pa., 88p., 1970. 27 refs.*

On December 3, 1970, a Pennsylvania Department of Environmental Resources (DER) was established. The powers and duties of the new agency, covering air and water resources, include developing an environmental policy for the state engaging in natural resource mangement and development, promulgating and enforcing environmental rules and regulations, and providing for the recreational and open space needs of the Commonwealth's citizens. The Citizens Advisory Council, composed of 18 members and the Secretary of DER, is an advisory body which will review environmental laws, make recommendations to the Secretary regarding the Department's work, and report annually to the Governor and the General Assembly. The Environmental Quality Board consists of 12 ex-officio members, four members of the General Assembly, and five members of the Citizens Advisory Council. Its responsibilities include developing a State master plan, formulating rules and regulations regarding the Department's functions and environmental resources previously, vested in the agencies, boards, and departments which DER supercedes, and establishing rules for the use of State parks and forests. The Environmental Hearing Board is composed of three attorneys who are empowered to hold hearings and issue adjudications on the regulation of pollution. Ten specific recommendations for improving the effectiveness of DER are given. For example, the State Administrative Code should be amended to include a a statement of Commonwealth environmental policy to which all specific resource policies would be subordinate. Public hearings should be held by DER on all major policy questions before final action is taken. The Department should have a structure which is broad enough to use a functional approach for enforcement, licensing, management, and research, and a program approach where specialized knowledge is required.

11962 APTIC NO. 29065

Detrie, J.-P.

THE INDUSTRIALIST AND THE PROBLEM OF ATMOSPHERIC POLLUTION. *(L'industriel devant les problemes de pollution atmospherique). Text in French. Tech. Moderne, 63(2):51-52, Feb. 1971.*

Earthquakes, floods, cyclones, epidemics, fires and snow have in 1970 caused more deaths, destruction and damage than all pollutants put together. The alarm raised in 1970 about the environment had led to the imposition of unrealistic maximal permissible pollution levels especially in the USA in the hope of forcing industry to try to comply with such standards. The demands imposed on the automobile industry in the USA for 1975 will not be met. The U. S. authorities have taken an extreme position, the German authorities have taken a more reasonable stance and have worked out norms for each industry after consulting the industries concerned. Swedish authorites have adopted moderate norms. In France the environmental law of 1917 is still in force and it was left to the discretion of the inspectors to judge each case on its merits. This procedure has led to great discrepancies. Maximal permissible levels are being introduced but this is being done in a gradual and realistic manner. Abatement plans for old established industries are being worked out with syndicates of each industry. Only the future will disclose which approach will be more effective in reducing pollution, the U. S. approach which imposes unrealistic demands on industry or the French approach which is trying to gradually improve the existing situation. While power consumption in Paris has from 1964 to 1970 increased by 50% SO2 and smoke pollution have been reduced by voluntary compliance by 35-40%.

11963 APTIC NO. 29102

Strong, Maurice F.

THE THIRD WAY. *J. Air Pollution Control Assoc., 21(2):54-56, Feb. 1971.*

Of the two main public reactions to the air pollution crisis, the first is simply to stop all activity having deleterious effects on the quality of the environment. The second reaction is to continue industrial development on traditional lines, relying on science and technology to come up with the answers before it is too late. In contrast to these negative approaches, a positive approach to the environmental crisis is suggested that has as its point of departure the constructive application of scientific technologies to human and social activities. This approach would emphasize what can be done to start improving the state of the human environment and to enhance the productivity of the ecosystem. The approach implies a search for knowledge and relevant concepts in which the United Nations Conference on Human Environment (Stockholm, 1972) could play a major role.

11964 APTIC NO. 29162

Sussman, Victor H.

A CRITIQUE: NEW PRIORITIES IN AIR POLLUTION CONTROL. *J. Air Pollution Control Assoc., 21(4):201-203, April 1971. 2 refs.*

The Air Quality Act of 1967 was based on the Air Resources Management concept which has been found, in practice, to be meaningless and unworkable. The Act, for example, conceived of air quality regions, or air basins, that would be areas of uniform air quality, demography, or problem (emission) types. In implementing the Act, emission inventory information was used with diffusion modeling to determine the reduction in emissions needed to achieve ambient air quality standards. Not only did most states set these standards at close to background levels, but the proposed air quality regions were too large to be considered air basins or areas of uniform problems. Most were designated according to country lines--which are not directly related to diffusion phenomena. The Clean Air Act Amendments of 1970 call for a more direct and pragmatic approach, e.g., basing emission standards on the best available control technology. Diffusion modeling, therefore, need not be used in relating ambient to emission standards. The effort devoted to this exercise should be replaced by productive activities such as the development of realistic emission standards, the standardization of air sampling systems, and the application of land use and waste management techniques to control air pollution.

11965 APTIC NO. 29163

LEARNING HOW TO CONTROL POLLUTION. *Plant Eng., vol. 23:62-63, Sept. 4, 1969.*

Regulatory agencies, trade associations, seminars (including those sponsored by equipment suppliers or consultants), and technical societies are important sources of information for the plant engineer planning a pollution control program. Particularly detailed services are provided by state air and water pollution control agencies, a list of which is compiled. The address of each agency is given.

11966 APTIC NO. 29230

Japan Public Health Assoc.

STUDIES ON THE RANGE OF DISEASES DUE TO EFFECTS OF POLLUTIONS. *(Kogai no eikyo ni yoru shippei no hani to ni kansuru kenkyu). Text in Japanese. 42p., March 1970. 18 refs.*

In 1969, the ministry of health and welfare established a committee to examine the designation of diseases due to pollution. Committee members were divided into groups to tackle diseases peculiar to particular regions. A subcommittee was organized on Minamata Disease, since it was prevalent at two different localities in two different periods. The second general meeting was held in December 1969, establish a law concerning special measures to relieve the health damages due to pollution. Discussion was held based on the reports from various groups and a report was made incorporating necessary ordinances and public notices in accordance with the law. The committee members believed that bronchial asthma, chronic bronchitis, asthmatic bronchitis and emphysema should be designated, although they are non-specific diseases, as different from specific diseases like Minamata Disease and Itai-itai disease, which are brought about by polluted water. Overall judgment would have to be made based on the history of residence and disease, since it is difficult to clinically distinguish diseases due to air pollution and those which are not. Other diseases may occur after the primary disease. The diagnosis of chronic asthma should be in accordance with the definition of the American Thoracic Society, and emphysema should agree with the Emphysema Study Association Diagnosis standards. The minimum items to be checked are: lung capacity one second volume, tracheal resistance, residual volume (if necessary), chest x-ray, heart function (if necessary), blood pressure, electrocardiogram, blood test (red and white corpuscles and hemoglobin), phlegm (shape, volume, and microbes), skin reactio to allergy, and house dust. The report also contains a section on organic mercury and cadmium. It is recommended that further studies of the effects of pollution be made and that notes be compared by those concerned in different areas. Extracts of the laws related to pollution health damage are given in the appendix.

11967 APTIC NO. 29265

Savas, Emanuel S.

COMPUTERS IN URBAN AIR POLLUTION CONTROL SYSTEMS. PART A. PLANNING FOR POLLUTION ABATEMENT. PART B. MONITORING, PREDICTION, AND CONTROL OF AIR QUALITY. *Socio-Econ. Plan. Sci., vol. 1:157- 183, 1967. 25 refs.*

In order to place the air pollution control problem in perspective, a brief overview of the entire waste-handling process is presented for solids, liquids, and gases. A systematic approach to long-term and short-term planning for air pollution abatement is described. Goals of the planning process, alternative plans, criteria for selection of alternatives and a procedure for conducting the evaluations are discussed. A comprehensive spectrum of abatement plans is presented. The conceptual outline of a suitable simulation system to facilitate planning by local air pollution control agencies is portrayed and the elements of the system are identified. Several available diffusion models that might be employed in such a simulation system are described. A framework is developed for viewing the evolutionary stages of an integrated urban air pollution control system. Current off-line systems are characterized by manual reporting of air quality and manual inspection procedures for emission sources. On-line air monitoring systems, featuring remote, unattended sensor stations, enhance the responsiveness of the local air pollution control agency. Site selection on factors are discussed. A true pollution early-warning system requires improved meteorological prediction as well as improved air quality prediction. Spatial as well as temporal variability in urban pollution patterns suggests the need for small area prediction and offers the possibility of exercising specialized control action in local areas rather than gross, city-wide actions which may be almost catastrophic in economic terms. A medical information subsystem, and on-line stack monitoring, may also be incorporated into the integrated system. (Author abstract modified)

11968 APTIC NO. 29306

Bruns, Wilhelm

THE FIRST AUTOMOBILE EXHAUST GUIDELINE OF THE COMMON MARKET: AN IMPORTANT INSTRUMENT FOR IMPROVEMENT OF ENVIRONMENTAL PROTECTION IN EUROPE. *(Die erste Kraftfahrzeugabgas-Richtlinie der Europaeischen Gemeinschaften: Ein wichtiges Instrument zur Verbesserung des Umweltschutzes in Europa). Text in German. Staedtehygiene (Velzen/Hamburg), 22(4):91-96, April 1971.*

Once enacted into law, the first automobile exhaust-gas bill prepared by the Common Market will be binding on all member states. Some passages of the bill will become effective in the fall of 1970, others in 1971. Direct comparison of the Common Market regulations and the regulations existing in West Germany is not feasible since the latter relate emission limits to fuel consumption and the former make them dependent on vehicle weight. The Common Market limit values for emission of air pollutants are, to some extent, considerably milder than all German regulations. Also, the inspection methods required by the Common Market regulations necessitate better adaptation to the existing state of the art. In addition, coordination with countries overseas, e.g., the U. S., will be necessary for the future.

11969 APTIC NO. 29351

Kawasaki Municipal Office (Japan), Environmental Pollution Dept.

ENVIRONMENTAL POLLUTIONS IN KAWASAKI CITY. *(Kawasakishi no kogai). Text in Japanese. 49p., April 1970.*

Since before the war, Kawasaki City prided itself on heavy industry but at the end of August, 1955, all the gingko leaves full of holes fell to the ground, overnight. At the end of 1955, some of the citizens organized the Smoke Countermeasures

Council. From 1957 on the coastal factories were investigated for information on fuel, heat control, smoke emission, and multi-cyclone dust collecting equipment. In July, 1956, 16 deposit gauges were installed to measure dust, and in April, 1957, the lead dioxide method was used to measure sulfur dioxide. Since then, an automatic recording telemetry system has been installed, and the coastal industrial area is shown on closed circuit television in city hall. Two publi health clinics were started in February, 1970 to relieve health damage. Twenty-nine staffs break down the responsibilities for dealing with complaints and appeals on environmental pollution. During 1970, the budget for civil engineering was $9493; for the port, $1272; for comprehensive plans, $9666; and for education, $16,661. The city s equipment is described and 16 deposit gauges are shown on the map. The type of furnaces and incinerators, the number of factories and furnaces, and the number of factories which reported in accordance with legislation are listed. The metal processing machines, blowers, air compressors, crushers, looms, and the number reported in accordance with the law are also listed. Loans to industry to prevent pollution increased from 1967 s $11,100 to 1968 s $11,984 and to 1969 s $15,876. The industries were required to report the number of equipment, boilers and incinerators which emit smoke, in accordance with the law. In 1969 pollution cases numbered 518 pending, 271 occurring during the year, 352 solved, and 50% on noise. Air pollution alarms since July, 1969 are listed. Change in SO2 concentration and dust and water quality by areas, is shown. Of 142 patients, 127 were suffering chronic bronchitis, bronchial asthma, asthmatic bronchitis, and emphysema because of air pollution. Regulations are shown for Kanagawa Prefecture and Kawasaki City, concerning the Kawasaki City Pollutions Countermeasure Councils, loans for prevention facilities, the determination of pollution diseases, relief of health damage, automobile exhaust gas concentration, and air pollution alarms. The factories which cooperate with the air pollution alarms are listed.

11970 APTIC NO. 29367

Japan Environmental Hygiene Center, Tokyo (Japan)

PRESENT SITUATION AND DIRECTION OF POLLUTIONS COUNTERMEASURES. *(Kogai taisaku no genjo to hoko). Text in Japanese. 17p., 1970.*

Pollution problems in Japan and the trend in pollution control prior to the enactment of the Pollution Countermeasures Fundamental Law are reviewed. This law provides the basis for control of all forms of environmental pollution. Out of it stems a large family of specialized laws for air, water, land subsidence (settling), and noise protection, related research and development; and tax basis for these programs. Still lower on the legislative tree are acts directed at specific industries identified as perpetrators of environmental damage. The inevitable overlap of ministerial authority in this complex situation is commented upon and the targets and probable trends of the pollution abatement programs are discussed.

11971 APTIC NO. 29369

Toyama Prefecture (Japan)

ORDINANCE OF TOYAMA PREFECTURE CONCERNING PREVENTION OF ENVIRONMENTAL POLLUTIONS. *(Toyama ken kogai boshi jorei). Text in Japanese. 3p., June 17, 1970.*

By living environment includes the properties, animals, and vegetables which are connected with people s living. Special facilities means factories or workshops which emit soot, smoke, and combustion gases, and which are being regulated. Entrepeneurs must take necessary measures to prevent pollution and must cooperate with the control measures established by the government. The prefectural government is in charge of administering policies over wide regions, coordinating and adjusting the measures enacted by the cities, towns, and villages, and cooperating with the planning and enforcement procedure instituted by the municipalities, which in turn help to enforce the control measures of the prefectural government. The governor can recommend improvement of the special facilities, methods of use, and the emission of sooty smoke by delimiting the time period when a standard must be met.

11972 APTIC NO. 29418

Fukunishi, Toyoji

AUTOMOTIVE EMISSION GASES FROM MOTOR VEHICLES MANUFACTURED IN JAPAN AND AIR POLLUTION PROBLEMS. *(Waga kuni no jidosha no haishutsu gasu to taiki osen ni tsuite). Text in Japanese. Jidosha Gijutsu (J. Soc. Automot. Engrs. Japan), 25(3): 222-227, March 1971.*

A long range program on the control of automotive exhaust gases was implemented in September. Measurement equipment was installed from the latter half of 1964 and was the basis for a 4-mode 0test. From the beginning of 1965 to early 1966, the exhaus gas of new automobile models was measured and basic data were compiled. It was requested that all automobile manufacturers have the exhaust gas of new models measured by June 1965. In the first half of 1966, the companies were advised to buy non scattering infra-red spectrometers. The Japanese Automobile Industry Association established a special committee or exhaust gas and the improvement of the combustion system was studied from 1965. The results of a survey of the health effects of exhaust gas were reported and from then on public opinion was clamorous. On February 20, 1970, the carbon monoxide standard was changed to average 20 ppm in 8 continuous hours, or 10 ppm hourly average for 24 continuous hours. All carburetors must now b of uniform performance, and air/fuel ratio must be set for a lean ratio. Idling will not be interefered with and the induction manifold must be modified to permit even distribution. For further control, engines must be modified so that the amount of hydrocarbon entering the reactor will decrease. Studies on catalytic converters will be continued. A combination of rotary engine, which produces less nitrogen oxides, or 2-cycle engine, reactor, afterburner, catalytic converter, or steam engine, should make possible the control of nitric oxide.

11973 APTIC NO. 29420

Yoshida, Katsumi

AIR AND WATER POLLUTION IN YOKKAICHI: ON THE PROBLEMS OF ENVIRONMENTAL DISRUPTION AND ITS CONTROL IN JAPAN. *Mie Med. J., 20(1):1-20, 1970. 3 refs. (Presented at the Training Program of Regional Development, 2nd, Chubu Centre, U. N. (Nagoya, Japan), Jan.-May 1970 and to the Science Council, Committee on Environmental Disruption, Yokkaichi, Japan, March 1970.)*

Kogai is the legal and popular word for public nuisance, referring to almost all the undesirable side-effects in the environment. The problem of public nuisance was brough out in 1962 with the problem of Yokkaichi asthma which was caused by severe air pollution originating in the Yokkaichi petroleum production and refining industry. Residual heavy oil was widely used instead of coal. Also, chimneys were not high enough to attain satisfactory gas diffusion. Increases in bronchial asthma, chronic bronchitis, and emphysema have occurred, as well as water pollution. Several control acts and a relief act for sufferers of obstructive lung diseases have been established. Both local and federal governments have passed regulations and ordinances. The relationship of various petroleum combines to seasonal wind directions, districts, obstructive lung diseases, sulfur dioxide, sulfuric acid mist, and ground concentrations are discussed. Automatic monitoring stations for SO2 have been set up using electroconductivity estimations, and pollution alarms can be given. Air quality criteria must consider ages and sicknesses. Also, the relief measures from medical damage has become a social problem. Laws, regulations, and standards are given for the ambient air quality, emission controls, prevention, smokes, chimney height, automobile exhaust, sulfur oxides, and water. Desulfurization of stack gas and heavy oil and the calculation of diffusion are also mentioned.

11974 APTIC NO. 29421

OUTLINE OF LEGISLATIONS CONCERNING POLLUTIONS PASSED BY THE EXTRAORDINARY DIET SESSION.

(Rinji kokkai seiritsu kogai kankei horitsu yoko). Text in Japanese. 16p., Dec. 21, 1970.

Legislation is outlined including, the Water Pollution Prevention Law, the law which partially amends the Pollution Countermeasure Fundamental Law, the law which partially amends the Air Pollution Law, the Water Pollution Prevention Law, the law which partially amends the Noise Control Law, the Marine Pollution Prevention Law, the law on the sharing of the financial burden for pollution prevention, the law on the punishment of crimes involving pollution harmful to human health, the law concerning waste treatment and cleaning, the law concerning the prevention of soil pollution, the law which partially amends the Sewer law, the law which partially amends the Road Traffic Law, the law which partially amends the Agricultural Chemicals Control Law, and the law which partially amends the Poison and Poisonous Matters Control Law. The definition of pollution is changed to include soil pollution, heated water from thermal generating stations, and paper mill sludge. The phrase, harmony with sound development of economy was delected, and it is now the responsibility of entrepreneurs to dispose of industrial wastes. The system of designating special areas for air and water pollution was abolished, and the emission standard is applicable all over Japan. Besides sulfur dioxide in factory smoke, cadmium, hydrogen fluoride, and lead are specifically mentioned. Governors can limit the use of facilities which emit sooty smoke and advise them to comply with standards on the use of fuel, improve water pollution, and prevent soil pollution. Also, the discharge of oil from vessels is restricted. A person in charge of controlling oil pollution must be designated to each vessel. Of willfull damages to health and life, are punishable by prison terms of detention of less than 2 years or of fines less than 716 dollars. Heavier penalties occur in the case of death or injuries. Individuals and corporations are punishable. Companies must manufacture easily disposable goods. Areas are designated which are feared to be heavily contaminated. Sewers must have a terminal disposal plant, or be connected with the sewer system. The Public Safety Commission can install and control traffic signals, and prohibit traffic, if necessary.

11975 APTIC NO. 29426

Ixfeld, H.

MEASUREMENT OF FLUORINE IMMISSION IN THE NORDRHEIN-WESTFALEN STATE.

(Fluor-Immissionsmessung im Lande Nordrhein-Westfalen). Text in German. VDI (Ver. Duet. Ingr.) Ber., no. 164. p. 71-75, 1971.

To determine the phytotoxic effect of fluorine concentations, the State Institute for Emission Control and Land Conservation in Essen instituted beginning with January 1971 a fluorine concentation measuring program involving about 1000 measuring stations situated between Cologne and Duesseldorf-Neuss. The measurements are discontinuous (spot checks) where the stations are near to each other, continuous where the distance between stations is considerable. The program also measures organic substances in the atmosphere by the silica gel method and dust concentration by the impactor method and by the membrane filter method. A comparison of measuring results obtained by the sorption method (sorption of gaseous fluorine compounds by silver balls coated with layers of sodium carbonate) with results obtained by the Impinger method disclosed that the latter method yielded up to 400% higher results because it also measured fluoride particles while the sorption method registered only gaseous fluorine compounds. For this reason, sampling was done with a filtering device which eliminated coarser particles. Such a preliminary filter (Herpertz-Topf filter) reduced the discrepancy between the results obtained by the two methods to 10-20%. This arrangement thus selectively measures only gaseous fluorine compounds with a maximum of 10% fluorine in particle form. Because about 200 samples have to be analyzed daily, an automatic device using lanthanum fluoride electrodes has been developed. The potentials are measured by a digital pH meter.

SOCIAL ASPECTS

11976 APTIC NO. 27680

Hoshoka, Yasuyuki, Shinofu Niki, Tomohiko Ishiguro, Yoshiyuki Katori, and Yoshihiro Shigeta

IMPORTANCE OF OPINION SURVEY USING QUESTIONNAIRES IN ODOR POLLUTION SURVEY. REPORT NO. 3 ON STUDIES OF ODOR).

(Akushu kogai chosa ni okeru anketo kikitori chosa no juyosei (Shuki no kenkyu dai 3 po). Text in Japanese. Preprint, p. 38-39, 1971. (Presented at the Disaster Prevention Chemistry Meeting, Japan, 11th, Jan. 1971, Paper 20.)

The approach of the Environmental Hygiene Center in conducting a questionnaire type of survey was to divide the area around a factory which was emitting an odor into 8-10 sections, then visit 30-40 houesholds in each section, preferably in the evening so that it would not only be the housewives who answered the questions. At the same time, a direct survey was made of the source of odor and the environment. Question No. 1 sought to determine the area of the odor and its degree, while an answer to the second question would indicate whether the factory had adopted odor counteraction methods. Several questions sought to determine who among the family members was most affected and for long, while the answer to the seventh question would indicate how meteorological conditions have affected the odor. A rendering factory and 133 people from 0.5 to 1.7 km downwind of it were chosen for the survey. Complaints ranged from 'unpleasantness' to 'no appetite'. The odor was strongest in the rainy season, from noon to evening, on cloudy days, with a west wind; wind velocity was not too high. An area in the vicinity of a pharmaceutical company was similarly investigated, and methylmercaptan and dimethylsulfide were detected chromatographically.

11977 APTIC NO. 28953

Dubos, Rene Jules, Leonard B. Dworsky, Theodore C. Byerly, and John A. Baker

MAN AND HIS ENVIRONMENT. SCOPE, IMPACT, AND NATURE. *In: Environmental Improvement (Air, Water, and Soil). Ralph W. Marquis (ed.), Dept. of Agriculture, Washington, D. C., Graduate School, p. 1-28, Oct. 1966.*

The closely entangled relationships between man and his environment create the situation in which we are living today. The environment must be compatible with the unchangeable needs of man's nature. It is unjustified to hope that man will eventually be able to adjust biologically to the new conditions created by crowding and technological developments. Ingrained psychological needs have as much force as physiological requirements. The fact that man achieves some form of biological or social adjustment to many different forms of stress such as air pollution is becoming a danger to his future welfare because this adjustment commonly results in pathological consequences which are often delayed and extremely indirect. Man is rapidly losing control over his environment because he introduces new forces so rapidly that he suffers the effects before he can evaluate their consequences. Environmental pollutants usually have indirect effects which manifest themselves through a complex chain of reactions. The ultimate goal of conservation should be to help man retain contact with the natural forces under which he evolved and to which he remains linked physiologically and emotionally. The success of certain highly organized states such as Sweden indicates that large-scale and environmental planning is possible. We have been irresponsible in spending only $1 million nationally on waste treatment research, in contrast to the $16 billion required for research and development.

11978 APTIC NO. 28956

Ripley, S. Dillon, Joseph L. Fisher, Ian L. McHarg, and Roland R. Renne

THE FUTURE OF ENVIRONMENTAL IMPROVEMENT. *In: Environmental Improvement (Air, Water, and Soil). Ralph W. Marquis (ed.), Dept. of Agriculture, Washington, D. C., Graduate School, p. 83-105, Oct. 1966.*

The future of environmental improvement depends largely on the level at which we harmonize our population with the environment. The International Biological Program (IPB) should be supported as the impetus for a lasting effort to understand human ecosystems, rather than as a program that will solve our problems of imbalance. There is a critical shortage of well-trained ecologists. The flow of sound information through society will play a significant role in the future of environmental improvement, but the latter depends on our willingness to undertake the task. There is not time to stabilize the population first and then concentrate on environmental improvement because the momentum of population increase creates ever-increasing problems while we are striving for control. Man's fulfillment will depend on creating humanized ecosystems of maximum diversity. A concept of equilibrium and the need for a planning process based upon ecological understanding is suggested. Conservation of energy, its utilization, and recycling through the system, are likely to attend systems in equilibrium. Components of an ecological planning method at a regional scale are identified. It is suggested that the ecological view and the criteria of ecology have relevance to the problems of man and his community.

11979 APTIC NO. 29214

Smith, T. R. Graves and A. Melvin

THE CASH VALUE OF MOTORWAY POLLUTION. *Civil Eng. Public Works Rev., 66(777):377-381, April 1971. 10 refs.*

To find out how much motorway pollution was worth to the people actually suffering from it, a survey was carried in the neighborhood of a recently completed segment of London's Ringway 1. People were directly interviewed in their homes during the winter of 1969 when the motorway had been open for about 6 months. The occupants of 81 out of over 300 households felt that the motorway had worsened the environment, and some evaluation of the nuisance was made in 51 of these cases. The number of tenants who answered the question about how much more rent they would be willing to pay to move away from the noise was 26. Fourteen people answered the question of whether they would be prepared to contribute to a fund to silence the motorway. Cost estimates are indicated. The topology of an urban motorway, that is whether it is in a cutting, on level ground or elevated on an embankment or structure, has a marked effect on the pollution it causes. The cash value of the nuisance caused by a section of motorway in east London is minute compared with its estimated traffic benefits.

11980 APTIC NO. 29432

Fisher, Fred

POLITICAL ASPECTS OF POLLUTION CONTROL. *Inst. of Environmental Sciences, Mt. Prospect, Ill., Proc. Inst. Environ. Sci. Annu. Tech. Meet., 17th, Los Angeles, Calif., 1971. p. 9-12. 3 refs. (April 26-30.)*

The issue of environmental pollution and control is a classic example of the political process in action in which those making demands (the public and public agencies) are confronted by those who oppose the demands and have the political power (corporate polluters, large and small). Large corporate polluters will do nothing, or next to nothing, to prevent injury to the public health except when they are forced to do it. In opposing the demands, these polluters use influence, authority, power, and mobilization of bias in non-decision techniques to thwart the demands from becoming issues and reaching the decision-making process. For example, gasoline companies are making claims that they have solved the problem of automotive air pollution by the reduction or removal of tetraethyl lead. Thus, they hope to thwart further decisions by convincing the public there is no longer a problem. However, lead additives are being replaced by other additives that pollute the air, and lower octane ratings mean that more gasoline is needed to power the car. Also, automobile manufacturers believe that if they did not think of an invention, it cannot be good, such as Japanese pollution control systems. Two methods can be used to combat the efforts of polluters who use the political system to prevent decisions: lobbying and maximum feasible participation. The Delaware Valley Citizens Council for Clean Air lobbyed for an obtained strong pollution standards. Maximum feasible participation usually involves a comprehensive project funded and run by a segment of government that is not directly concerned.

GENERAL

11981 *APTIC NO. 27774*

Rebiere, A.

ATMOSPHERIC POLLUTION. (La pollution atmospherique). Text in French. Ann. Mines (Paris), no. 11:5-6, Nov. 1970.

Pollution control is a difficult compromise between the protection of the natural and the human environment and the economy which is needed to sustain the needs of humanity. Technology possesses the means for reducing noxious effluents in the environment to a tolerable level under economically feasible conditions. The tasks to be accomplished include the determination of maximally permissible limits for the various pollutants and the development of appropriate measurement methods that would permit effective control. In contrast to water pollution, noxious air pollutants must be prevented from developing or must be eliminated before they reach the atmosphere because then it is too late to do anything about them. The development of pollution control methods for the principal polluting industries is the task of specialists and of research. The French government has earmarked a not inconsiderable sum of money for pollution control research in both the Fifth and the Sixth Plan. Adequate administrative action must be based on adequate legislation which will have to be formulated along the lines of protective legislation already in force in other countries.

11982 APTIC NO. 27786

Detrie, J.-P.

FRENCH RESEARCH ON ATMOSPHERIC POLLUTION. *(Etudes et recherches en France concernant la pollution atmospherique). Text in French. Ann. Mines (Paris), no. 11:77-84, Nov. 1970.*

A 'joint action' plan is described which provides for studies on the effects of pollutants to be carried out by medical and related schools in Paris, Lille, Orleans, Rouen, Montpellier, Bordeaux, Marseille and Toulouse in addition to research currently being carried out by specialized laboratories. Mention is made of the Commission of the European Community recommendation to study biological indicators on a plant, microbiological and cellular level to arrive at new criteria for pollution standards. Research currently being carried out on the detection of sulfur dioxide, nitrogen oxides, carbon monoxide, fluorine, carbon, ozone, oxidants and hydrocarbons; the establishment of networks of pollution monitoring stations; and research in the field of prevention and control methods is outlined. The various public bodies, authorities, schools, laboratories and industries concerned with the ongoing research are enumerated. Documentation and information centers are identified. A brief history of French research on atmospheric pollution is included.

11983 APTIC NO. 28803

Abelson, Philip H.

MAN-MADE ENVIRONMENTAL HAZARDS. 1. HOW MAN SHAPES HIS ENVIRONMENT. *Am. J. Public Health, 58(11):2043-2049, Nov. 1968. 17 refs. (Presented at the American Public Health Association, Annual Meeting, 95th, Miami Beach, Fla., Oct. 24, 1967.)*

Our affluent society, which produces many items for the consumer, has not given sufficient attention to the disposal of waste. Coal or residual oil burned to produce electricity, for example, causes substantial amounts of sulfur to pollute the air. Major exhaust emissions resulting from imperfect motor vehicle fuel combustion include carbon dioxide, carbon monoxide, gasoline, oxides of nitrogen, aldehydes and acids, nitrogen-containing organics, phenols, particulate matter, and lead salts. Exposure to 120 ppm carbon monoxide for one hour may be a serious health risk. Nitrogen dioxide is a respiratory system irritant. Airborne particulate matter may affect the health directly when it is inhaled or when it contains toxic substances such as the carcinogen, benzopyrene. The combination of airborne chemicals with particulate matter, sunlight, and adverse meteorological conditions can form smog or airborne sulfuric acid. Results of individual toxic agents are additive. Tobacco smoking hazards are increased when the individual is subject to urban air pollution. The growing carbon dioxide concentration in the atmosphere may slow heat loss from the earth, resulting in warmer climates. At the same time, the presence of particulate matter in the air partially reflects sunlight back into space, causing a cooling effect. The hazards of water pollution and exposure to radiation are also discussed. Other products of our affluent living patterns include noise pollution and social pollution (overcrowding). The impact of these factors is not easily evaluated.

11984 APTIC NO. 28952

ENVIRONMENTAL IMPROVEMENT (AIR, WATER, AND SOIL). *Ralph W. Marquis (ed.), Dept. of Agriculture, Washington, D. C., Graduate School, 105p., Oct. 1966.*

Four lectures are presented which center around the nature of man and what he can and must do to reduce the harmful effects of his present activities and to correct the harmful situation created by past activities. Man is extremely adaptable, but he is rapidly losing control over his environment because of the new powers of science which introduce new forces at such a rapid rate and on such a wide scale that he suffers the effects before he has a chance to evaluate the consequences and change his course. Current efforts to devise sound national policy and programs in the area of water and air pollution are discussed and critized. The economic and technological prospects for controlling the environment are explored. It is recommended that control of environmental be developed on a regional air or watershed basis to permit adoption and enforcement of area-wide quality standards. Prospects for future improvements of the environment depend on creating humanized ecosystems of maximum diversity.

11985 APTIC NO. 29305

Terada, Hatsuo

CADMIUM POLLUTION PROBLEM IN KURGBE CITY *(Kurobe shi ni okeru kadomiornu kogai mondai). Text in Japanese. Shisei (City Administration), 19(8):1-4, Aug 1970.*

A smelter that is a source of cadmium pollution currently operates in Kurobe City, nine electric furnaces. From the start-up of the smelter in 1961, farmers in the neighborhood reported yellowing of soy bean and rice plants. A survey concluded that the yellowing wa due to sulfuric acid gas. In 1963, the sediment pond in the factory overflowed and the water, seeped into the municipal water system. It was reported that the soil was polluted with excess copper, lead, and zinc, because at that time there was no accurate gauge for sulfuric acid gas and no knowledge of cadmium. In 1968, residents in the neighborhood of the factory complained of metal corrosion, and measurement of sulfuric acid gas was started. In 1969, the examination residents for cadmium was negative, but cadmium was found in the rice. Rice in the designated area was frozen; farmers had to buy rationed rice. No vegetables could be eaten and no rice was allowed to be grown within the designated area. Cow s milk was not contaminated. One of the two cadmium-discharge sintering furnaces was closed down.

11986 APTIC NO. 29457

Iwakuni Dept. of Welfare (Japan), Section of Public Nuisance

OUTLINE OF ENVIRONMENTAL POLLUTION IWAKUNI CITY. *(Iwakuni-shi no kogai gaikyo). Text in Japanese. 154p., Dec. 1970.*

The present state of air and water pollution, noise, offensive odors, and control measures in Iwakuni City, a chemical industrial district in Yamaguchi Prefecture are reviewed. Air pollution is caused mainly by sulfur oxides, and the degree of air pollution increases from spring to summer when the town is on the leeward of the main factories. From 1965 to 1969, dustfall values (by the British Standard deposit gauge method) were generally low and showed no marked fluctuations due to a reduced consumption of coal. The concentration of sulfur oxides (by the lead peroxide method) showed a peak of 0.52 sulfur trioxide mg/day/100 sq m of PbO_2 in 1967, with a gradual decrease since them. The dustfall level was 7.17 tons/sq km/month and the concentration of sulfur oxides 0.45 SO_3 mg/day/100 sq cm in 1969. Fifty percent of the air pollution with a concentration of sulfur oxides over 0.15 ppm occurred when the wind speed was 1.0-2.9 m/sec. Waste water from chemical, pulp, and petroleum factories caused river and sea-water pollution. Most of the noise arises from small and medium-size factories which increase yearly. Legislation, improved control of facilities of the pollution sources, and guidelines for abatement are carried out to prevent environmental pollution.

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